THE AMERICAN JOURNAL OF ROENTGENOLOGY

Editor, H. M. Imboden, M.D., New York.

VOL. V (NEW SERIES) SEPTEMBER, 1918 No. 9

CLINICAL OBSERVATIONS IN MILITARY ROENTGENOLOGY*

WITH ESPECIAL REFERENCE TO THE BISMUTH-IODOFORM-PARAFFIN PASTE OF MORISON AND TO A METHOD FOR THE DETERMINATION OF THE PRESENCE OF FOREIGN BODIES BY SECONDARY EMANATIONS

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THE following communication is offered as a meagre exposition of some impressions created and noted in actual field practice in military roentgenology under the present-day technique of the care of the wounded as pursued by certain of the Allied Forces. Its purpose is to describe conditions not unusual which have been met with by the writers, and which may be met with by any roentgen worker who enters the European war area. As in every form of scientific endeavor, it may be found that in clinical situations of the greatest expediency practice is far removed from theory, and many thoughtfully evolved technical plans must, of necessity, be abandoned under the pressure of active field service.

The military roentgenologist, desirous of contributing to the scientific literature, and stimulated to that end by a prospect of the relative quietude of routine, or even of research, at a so-called base hospital, often finds himself detailed to what may be in reality an evacuation hospital of large dimensions, where convoys of wounded are succeeded by proportionate evacuations in rapid rotation. The keynote at such posts, therefore, with relation to the wounded and consistent with their proper care is *speed*, and this is always a desideratum, even at the base, in time of "push." Under such circumstances, the simpler cases must, and can, be quickly handled to make way for those of a more complicated nature in which localizing methods of greater precision are necessary. At such periods of pressure, the load of disproportion between volume of work and available time weighs most heavily upon the *x*-ray department, because many cases pass through the hands of the roentgenologist only to be returned to a convalescent camp without operative treatment, although presenting a definite surgical complexion. Also, many cases are sent down from the casualty clearing stations (evacuation hospitals) a

*Published by authority of the Office of the Surgeon General.

few kilometers behind the Line, bearing *x*-ray diagnoses, which must needs be again examined at the base on account of their nature, and this fact in no way detracts from the wonderfully accurate

FIG. 1. CASE A. GUNNER G. 29TH YORKSHIRE REGIMENT.

Here the intermuscular dissemination of "bipp" does not occlude the foreign body.

roentgen diagnoses made under pressure in forward areas; on the other hand, this accuracy is usually proven by the subsequent diagnostic procedure at the base.

While the activity of a military *x*-ray department is naturally directly proportionate to the existing degree and nature of military operations, the capacity for speed must always be maintained in order that any unusual pressure may be withstood. Since so great a part of the surgical roentgenology of a military station deals with the localization of foreign bodies the writers have found that, on occasions when vast numbers of such localizations must be made, the most simple methods consistent with accuracy must be employed. This statement by no means implies the lack of appreciation of the many localization methods which the war has produced, but their many excellent points do not always coincide with the necessity for rapidity, which in our experiences has been almost constant. We have found that a simple parallax method, or an equally simple "displacement" method, suffices admirably for all purposes except where especially accurate transference of extraneous "known points" is to be made to the surgeon, as the use of the compass method would insure. Such accuracy is demanded nearly always in cases where it is important to take the necessary time for the purpose. Our simpler problems were always set aside for cases such as wounds of the head and thorax, where the greatest possible degree of exactitude is required. In the simple cases we found that we could work best and quickest with one of the two methods first mentioned (to wit, a simply managed parallax method and a method of displacement such as might be exemplified in the Strohl method). Our record of one hundred and forty-three localizations in the twenty-four hours tends to bear out this general statement.

It is essential to localize as near to the foreign body as possible. In other words, to so manipulate the patient, if possible, that the shortest distance will be obtained between screen surface and foreign body. Our method of doing this implied two steps. First, a preliminary step of "gross localization" by which, upon rapid tube-displacement from side to side and in the direction of head to feet, the speed of shadow movement will indicate clearly *in gross* the distance-relation to the plane of the screen. If it is thus found that the horizontal plane of the foreign body be deeper than the medium horizontal plane of the part under examination, the patient is turned or manipulated, whenever possible, so that the short distance is up-

permost. The second step is then undertaken—that of finding the central ray and proceeding with the localization method

FIG. 2. CASE B. PRIVATE K. SHERWOOD FORESTERS. Multiple foreign bodies, with much "bipp" simulating others.

of election. The question of the manipulation or movement of the patient is always influenced by the severity and extent of the wounds. The eminent likelihood of secondary hemorrhage, the question of intense pain on motion, the presence of gas infection or gas gangrene, the presence of Carrel tubes, will all make at times the acquisition of desirable postures difficult if not impossible. It is unfortunate that there is no such thing as standardized positions in military roentgenology.

Perfect *liaison* with the surgeon is possible only when he is informed of the position the patient was in when the second localization step was undertaken, and such *liaison* is maintained only when he bears in mind that the skin mark of the vertical ray should be the highest point of the vertical axis of that part. If there be no skin to mark at this point, there are numerous ways of marking tissue other than skin.

It is unfortunately the case that there are other impedances to obtaining gross localization beside the nature and distribution of the wound or the multiplicity of the wounds. Such handicaps may often result from the presence of material injected into the wound in forward areas

FIG. 3. CASE C. CAPTAIN A. 11TH HANTS REGIMENT. Wide dissemination of "bipp," not grossly obliterating foreign bodies (projectiles).

for the purpose of producing antiseptic action. The presence of these substances, although not distinctly deterrent factors to ultimate diagnosis should be constantly

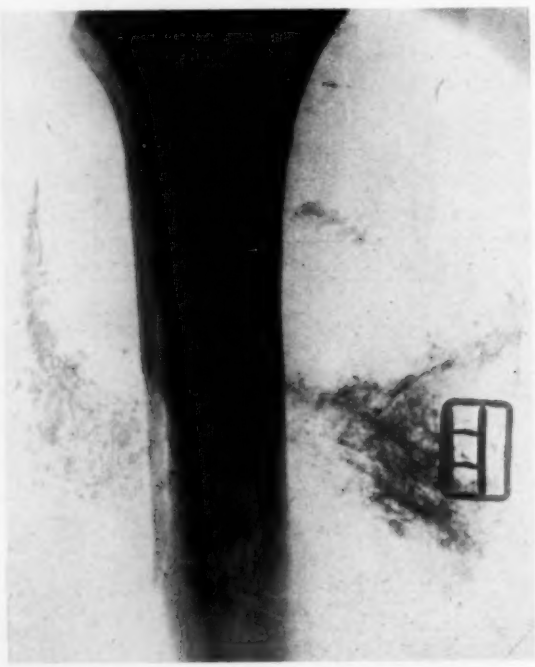

FIG. 4. CASE D. PRIVATE H. BLACK WATCH.
Fine spread of "bipp" which does not occlude projectile material.

borne in mind as to their existence in any given case. Out of the various antiseptic methods employed by the British perhaps that which was most constantly encountered by us was the presence in or about the wound of the so-called bismuth-iodoform-paraffin paste of Rutherford Morison, first described by him in 1916. This combination, as the basis of an injected dressing for infected wounds, presents varying manifestations as recorded upon the *x*-ray plate, and it is with these manifestations that the military roentgenologist should acquaint himself. In general, the disposition of this "bipp," as it is called in abbreviation, with relationship to the foreign body, may be: (1) an engorgement of the track with embracement of the body itself, or (2) wandering from the track into the surrounding tissue without any special or characteristic relationship to the foreign body. The latter manifestation varies, naturally, with the degree of septic tissue-disorganization. The roentgen graphic evidence of the presence of "bipp" often transcends that of foreign material acquired in combat. It becomes, therefore, a matter of some moment promptly to recognize by screen the extent and form of "bipp" distribution, in differential comparison with the size and position of the foreign body or collection of bodies. With but short practice, this differential diagnosis becomes easy by but a glance at the screen, and it is rarely that a plate is required to settle the point. Where they do occur, however, instances of unusual difficulty are seen in cases where either a single very small foreign body or a multiplicity of foreign bodies may be present. Here a somewhat sporadic or finely disseminated distribution of "bipp" may lead to a perplexing shadow-complex by screen which, it may be, a plate only can elucidate. It is injudicious to pin one's diagnostic faith on the as-

FIG. 5. CASE E. SAPPER M. GORDON HIGHLANDERS.
Large projectile almost completely occluded by "bipp."

sumption that shrapnel or other forms of projectile will produce stronger shadows than bismuth-iodoform-paraffin emulsion,

FIG. 6. CASE F. PRIVATE G. SCOTS GUARDS. Carrel tube draining an extensively "bipped" wound.

for, as a matter of fact, this is not so; especially when in a given shadow-complex, the two substances vary widely as to screen-plane or plate-plane relationship.

The screen-diagnosis of the presence of a relatively small foreign body in close juxtaposition to larger and often denser "bipp" masses is a problem of a different nature, although often of equal degree. It is usually possible to disassociate the respective shadows by either movement of the subject or of the tube, although cases may arise wherein even this produces but little added information. Even the plate at times effects a differentiation only with difficulty.

Inter- or intramuscular "bipp" distribution presents diagnostic difficulty only rarely, as the "bipp" shadow in such cases usually forms a thin tracery which in no wise occludes the shadow of even a minute foreign body.

The bismuth-iodoform-paraffin paste of Morison is but one of several extraneous substances, as has been mentioned, employed in the surgical treatment of infected wounds, which may offer slight problems of differential diagnosis by *x*-ray. For instance, the shadows of cross-sections of Carrel tubes have also been known to stimulate foreign bodies of meagre density; the relative surgical value of bismuth-iodoform-paraffin, however, makes it a necessary therapeutic factor which the military roentgenologist must educate himself to meet in diagnosis.

The inclusion and exclusion of secondary rays and the well-known screen appearances in such performances may be

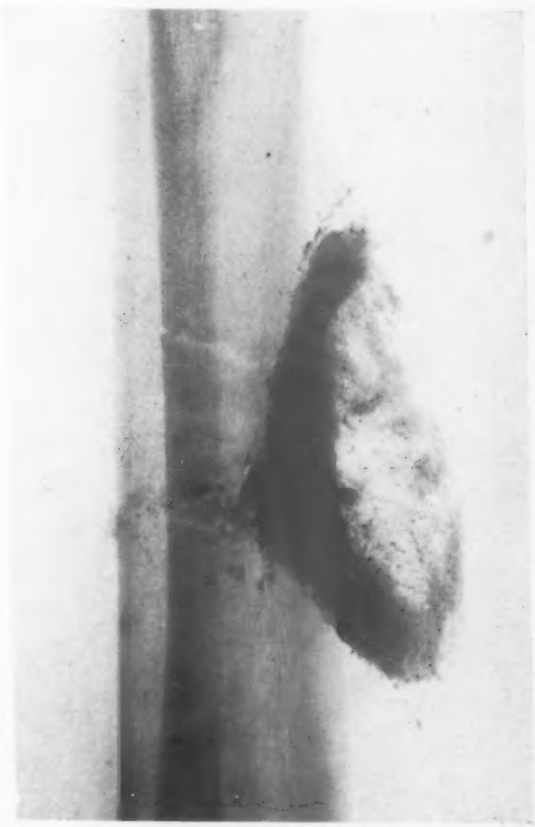

FIG. 7. CASE G. SERGEANT P. 3RD GLOUCESTERS. Large mass of "bipp," occluding projectile.

utilized to lay a diagnostic foundation in rapid way as to the presence or absence of foreign body in any given field. This

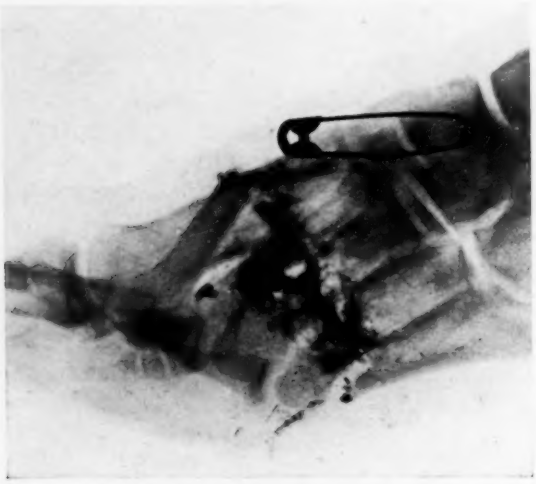

FIG. 8. CASE H. PRIVATE R. M. G. C.
Large projectile, with others complicated by "bipp."

method has been found especially useful by one of us (Brown) as applied to the region of large joints, where dense bony masses are normally found. In thin subjects, especially, it will often be found that anatomic structures, as, for instance, the coracoid process, will, when vagrant rays are excluded by diaphragm, appear of such localized density as closely to simulate a foreign body of corresponding size. When close fluoroscopic search is being made for a foreign body within the joint, this fact may for the moment be confusing until the diaphragm is widened sufficiently to allow a brilliant vagrant illumination of the visualized screen-field. This illumination will immediately produce an obliteration of the shadow-prominence in question, if it be anatomical and normal; if it be a foreign body, it will, of course, absorb the vagrant as well as the normal rays and its shadow will persist. This "short cut" method enables one, in field service, at once to exclude from the region about the important joints especially, the possibility of error in recognition as between foreign body or prominent anatomic process of great density. If foreign body is thus determined it may be localized by any of the accepted or generally used methods.

In conclusion, we desire to acknowledge the support and coöperation we have received in our work from our respective Commanding Officers, Lieutenant-Colonel Robert U. Patterson, M.C.U.S.A. and Colonel C. C. Collins, M.C.U.S.A.

CAUSE OF LEUKEMIA

The *Nederlandsch Tijdschrift* summarizes an article by Wiczkowski in the *Przeglad Lekarski* relating that he succeeded in inducing a disease in a hen, resembling in some respects human leukemia, by intravenous injection of pleural effusion from a young man who had developed acute leukemia after a trauma. The leukocytes numbered 590,000 and there was pleurisy on one side. In the hen the hemoglobin dropped from 55 to 9 per cent. and the bone marrow showed infiltrates, etc. The clinical picture differed completely from that with so-called fowl leukemia. (Ref. *Journal Amer. Med. Assoc.*, Vol. 71, No. 10.)

INFLUENCE OF RADIUM ON CANCER TISSUES *

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WHAT I have to say concerns not so much the therapeutic accomplishments of radium, as the effect the advent of radium has had on the general progress of cancer research.

Since 1904, it has been my lot to make periodic visits to cancer research institutions in Europe, and I recall two observations of special interest in connection with the treatment of cancer. I found that these institutions were always in the habit of employing some constitutional agent in the treatment of inoperable cancer. The list of the agents used was quite large, and included thyroid extract, antisera made against tumor proteins, injections of tumor proteins, vaccination by living cancer cells, and a number of toxic substances, among which were enzetol, colloidal copper, and other metallic colloids. The Huntington Fund in New York has spent a good deal of time investigating many of these agents, and vaccination, especially, has been used on an enormous scale all over the world.

The second fact of importance is that there were definite and well-attested therapeutic results obtained by many of these agents. These results, however, were so uncertain and capricious that one could never be sure that they were not due to some spontaneous change in the natural history of the disease, so much so that a distinguished French surgeon, Tuffier, characterized them as paradoxical. Now in the case of radium, the conditions are entirely different. It has been evident from the very first that when one applies the same amount of radium through the same filter to the same type of cancer, the result is invariably the same.

We must welcome the discovery of an agent which will affect cancer in a manner not open to argument. Radium can be relied upon to do the same thing under the same circumstances. Under many circumstances the result involves the disappearance of cancer tissue and the complete healing of the lesion. It is highly important, also, to recognize that the action of radium is specific, in the sense that it produces results which have not been duplicated by any other method, and produces histological changes in tumor tissue which one does not see under any other circumstances. What these changes consist in will be shown later in the evening, and I will not attempt to analyze them in detail, but they are controlled by two general principles.

Radium exerts its chief effect upon the cell nucleus, especially upon the dividing nucleus, by means of which the growth of the cells is inhibited and they undergo a peculiar form of liquefaction necrosis and atrophy. Another important principle of its action is the effect upon the underlying tissue in which the tumor is growing. It stimulates the growth of granulation tissue, which excavates the cells of the tumor and causes a remarkable exudation of various round cells, the result being a natural and complete healing process.

In estimating the effects of radium upon tumor tissue, it is highly important to recognize that different tumor cells react in a very different manner to radium, some tumors being extremely susceptible and others very resistant. Among the susceptible growths are the very cellular and rapidly growing tumors, as lymphomas, embryonal carcinomas, and basal cell carcinomas. On the other hand, squamous cell carcinoma is comparatively resistant. The benign tumors and those which contain a considerable amount of dense fibrous tissue are quite resistant.

* Discussion at the Meeting of the County Medical Society, May 27, 1918, at the New York Academy of Medicine.

The pursuit of radium therapy has required a study of the whole list of tumors with regard to their physical and chemical constitution which determines their response to radium. The numerous conflicting reports which one hears regarding the results of radium therapy are very largely due to the failure to recognize those essential differences in tumor structure.

Any prophecy as to the future position of radium is perhaps ill-timed. In one respect, this agent is far from being an ideal cancer cure. As employed at present, it has no constitutional influence at all. It may be possible that, by injecting radium in the form of deposit in salt solution, a constitutional effect can be produced, but this is a matter for future study. This and many other details in the proper application of radium form a complex field of investigation which requires the services of a well-equipped physical laboratory. At the Memorial Hospital we are conducting such experiments on a considerable scale, with the idea of making the application of radium more accurate and of employing it for different diseases in more appropriate ways. The local application of radium produces its effect over a limited territory. For that reason I firmly believe that its proper field is one in which the specific effects of this agent can be made to include the whole field of the tumor, and this means, as a rule, the comparatively early stages of cancer. As a remedial agent in advanced or inoperable cancer its results, while extremely important in many circumstances, will never, I believe, represent its greatest usefulness.

TREATMENT BY RADIUM OF CANCEROUS MUCOUS MEMBRANES*

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ANY ONE who has had an opportunity to observe the effects of the treatment of malignant disease by the use of radium cannot fail to recognize that an important field of usefulness must be assigned to this agent in the management of cancer.

It is a matter of much importance to accurately know the indications for this use of radium. At the present time, there is a wide difference of opinion upon the place in cancer therapy which radium should occupy. This difference is perhaps most strikingly expressed in one of the first questions, in this connection, to suggest itself. Should some of the more important forms of cancer be treated by radium in their early stages, in an attempt to cure the disease by this agent, instead of by operative removal, or should radium be used solely as a palliative or supplementary means to the usual methods of dealing with the disease?

Approximately a year ago, at a symposium on radium in this room, it was stated by one of the most important users of radium in this country, that those seeking to find in radium a cure for cancer would be disappointed, that in all forms of cancer, except possibly some of the benign circumscribed varieties of skin epithelioma, the most that can be expected from the use of radium is temporary improvement in the patient's condition.

*Read at the Meeting of the Medical Society of the County of New York, May 27, 1918, at the New York Academy of Medicine.

Improvements of a very considerable degree are obtained in many varieties of tumor. They are especially notable in the leucemias, in the lymphosarcomas, and in the very cellular carcinomata, such as the teratoid carcinomas of the testes, even after these have produced metastasis in the abdominal cavity. They may always be obtained after surface application to the carcinomas of the mucous membranes, even when of large size. Few, however, of any of the more advanced inoperable growths in which these improvements have been obtained, have failed to recur; and the fear that the same result would follow the treatment of the more favorable and smaller operable lesions by radium in a larger proportion of cases than it would follow the treatment of these patients by operation, has led to the belief that it would be unjust to treat these patients by radium.

At the Memorial Hospital, we have been encouraged to treat a rather large number of operable cancers of the mucous membranes. The remarkable improvement in some of the cases treated palliatively has not alone stimulated this attempt, but more especially the favorable result obtained on many early cancers in patients refusing operation, or in whom operation was contraindicated for other reasons. Two facts have been demonstrated by this experience: first, within the time limits in which we have been working, single applications were often sufficient to cause apparent complete retrogressions; and second, in the larger lesions, where this favorable result was not obtained, the lesion had become much more of an operable one than it was before treatment. There have been obtained, for instance, complete retrogressions within the time limits in which we have been working

In twenty-one cases of cancer of the lip.

In eight cases of cancer of the superior maxilla, including two originating within the antral cavity.

In nine cases of cancer of the tongue.

In one additional case in which a large growth was greatly reduced in size, and has since been removed under local anesthesia, without recurrence to date, an interval of five months.

In three cases of cancer of the tonsil, and probably in two others, which have not been traced to date.

In one patient with cancer of the soft palate.

A number of patients with cancer of the larynx have been greatly improved, but none have been cured by radium alone, although in several cases there was a complete disappearance of the disease for a time. In one patient, with advanced cancer of the larynx, an incomplete but marked retrogression of the disease was caused by radium.

At this stage, I removed the larynx, and the patient has been free from recurrence now for one year, and is able to speak loud enough to be heard across a small room.

In cancer of the esophagus, definite temporary improvements have been obtained from single treatments. These improvements have meant relief of the dysphagia, sometimes for one year, to a much greater degree than can be obtained by bouginage. One patient, whom I treated two years ago, and upon whom I made a diagnosis of cancer of the esophagus, at the time, by esophagoscopic examination, is still well. I believe, however, that it is not absolutely certain that this man had cancer of the esophagus. We did not secure, in his case, a confirmation of the diagnosis by microscopical diagnosis, and the cure of his condition by the application of the radium has not been duplicated in any other case.

Cancer of the rectum offers a most important and fruitful field for radium therapy. The operative cure of cancer of the rectum has been disappointing. Moreover, the necessity of establishing an artificial anus in the majority of the cases is a most serious drawback to the operative treatment of cancer of the rectum. While we cannot, at the present time, claim with the same certainty the favorable results in the

treatment of cancer of the rectum that we can in the more accessible cancers of the mucous membranes of the mouth, yet the results thus far obtained fully warrant the management of early cancer of the rectum by radium. If the entire management should not be by radium, at least the preliminary treatment should be by radium.

Among the patients whom we have treated, clinically complete retrogressions have been obtained in eight patients. At the present time we are unable to speak of absolute cures. Of these patients, one was treated first in August, 1914. When last heard from, a few months ago, he was well and working.

Life was prolonged in two other cases in comparative comfort for two years.

Three other cases are, at present, clinically free from disease at an interval of one year from the time of their treatment.

The majority of our patients had very advanced lesions, and the end results in these patients must be wholly discounted. The technique of the treatment of cancer of the rectum is constantly improving.

Unquestionably, the most promising field of radium therapy among the mucous membrane cancers is cancer of the uterus. It is possible to safely give these cancers very large doses, and it is doubtless due to this fact that, in my own experience at least, practically uniformly good results have been obtained. Among my own patients, I have two who had primary growths of the cervix, involving most of the vaginal surface of the cervix, from which positive microscopical sections were obtained. These two have remained well after one treatment for a period of two years up to the present time. At least five other patients promise equally good results to date.

The mixed tumors of the parotid, many of them being fairly cellular with the carcinomatous elements pronounced, have given almost specific response to radium treatment. We have five striking results among these tumors.

We have wholly omitted reference to epithelioma of the skin, not because the benefit conferred upon these patients is not a life-saving one, but because the problem is relatively simple. The real problem in the treatment of cancer today is the successful management of cancer of the mucous membranes. It is a problem unsatisfactorily solved by surgery alone. The delay in the treatment of these cases is not wholly responsible for this unsatisfactory solution by surgical means. In cases of cancer, in equal stages of growth, the character of the end result among cases cured by radium, coupled with the ease to the patient by which this result can be obtained, far surpasses the results of surgical ablation.

We offer these results, as demonstrating the possibilities of the radium treatment of early cancer of the mucous membranes. It is true that some of these results have been obtained in a manner which is far from ideal, nor have they been obtained uniformly in the same class of case. Nevertheless, the possibilities of the radium treatment of cancer are by no means exhausted. When we began our work at the Memorial Hospital, we little dreamed of the step to step improvement in technique, which we have already accomplished. This improvement promises satisfactory and fairly uniform results for the future.

RADIOTHERAPEUTIC METHODS IN THE TREATMENT OF UTERINE HEMORRHAGE*

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THE treatment of uterine hemorrhage with or without uterine fibromyoma is now so well established that we must assume that, given a sufficient dose, one can at will produce a permanent amenorrhea in women over thirty or thirty-five; and that in women under thirty a temporary amenorrhea can be brought about by careful dosage, while in women over thirty the latter result will be less certain. Secondly, the increasing number of cases reported with almost no specific denials indicate that a fibromyoma of the uterus will shrink to insignificant proportions after proper dosage with *x*-ray or radium.

Granted, then, that the above results may be assured, several problems remain to be solved. The first of these involves the selection of proper cases for such radiotherapy, and the second concerns the general method of application and dosage of these two agents for the bringing about of one of the three results above mentioned.

The conditions which are increasingly referred for this method of treatment are, first, those of excessive or prolonged hemorrhage from a uterus showing no gross pathological lesions, which occurs at puberty, at the menopause, and, to a less extent, during the whole child-bearing period, and, secondly, fibromyoma of the uterus in all its phases. The cause of the bleeding in the grossly normal uterus was up to about ten years ago believed to lie in anatomical lesions which represent various stages of inflammation, either in the endometrium or the uterine muscle and vessels. Chronic endometritis was a name applied to the conditions of the endometrium so frequently associated with uterine hemorrhage. This so-called chronic endometritis (endometritis hyperplastica, endometritis villosa, endometritis polyposa, etc.), as a primary cause of uterine hemorrhage, however, was effectually discredited by Hitschmann and Adler in 1908, and by many others since. Their researches have clearly shown that the swollen, congested edematous membrane is merely the counterpart or an exaggerated form of the normal premenstrual endometrium, and that although it, like the normal membrane, without doubt is concerned in the actual pouring out of uterine blood, nevertheless shows every evidence of being stimulated or otherwise affected by the same influences or substances which bring about normal menstruation.

Researches on clinical material and by direct experiment with substances injected into animals have clearly demonstrated that such a substance does exist in the corpus luteum in large amounts and also in the placenta. Other researches show that in individuals suffering from uterine hemorrhage there is, with striking frequency, found a ripe corpus luteum. In normal menstruation, at any rate, it has been shown that the cycle of hyperplasia and depletion through which the endometrium passes is coincident with the cycle of development and recession of the corpus luteum, and it is now universally believed that the dependence of the bleeding on the corpus luteum is absolute. It seems almost certain, then, that in the pathological, as well as in the normal, uterine bleeding some disturbance of the graafian follicle in some stage of its development—probably the corpus luteum—is the essential factor, whether this be in turn affected by other glandular substances, emotion, etc., or not. The pathological bleeding is merely a variation in amount,

* From the Department of Surgery, Columbia University.

duration, character or periodicity from the normal menstrual flow.

The other lesion in the grossly normal uterus associated with hemorrhage is fibrosis in the muscles and vessels, so-called chronic metritis (myopathic hemorrhage). The presence of large amounts of connective tissue in the uterine walls and vessels in cases of uterine hemorrhage was pointed out by Theilhaber. That, in a large majority of such bleeding uteri, there is an increase of connective tissue is demonstrated by an examination of even a small series of uteri. Pankow and a large following, on the other hand, present irrefutable statistical evidence to show that fibrosis of the uterus is just as frequent in the non-bleeding as it is in the bleeding uterus, and that this condition is a more constant sequela of multiple child-bearing than it is an associated lesion of the abnormally bleeding uterus. The previous error lay in the fact that practically all such uteri come from older women. In the majority of bleeding uteri which I have examined (all in multiparous women) both hyperplasia of the endometrium and fibrosis of the muscle have been present together. The presence of both weakens the importance of either as an essential cause of the abnormal bleeding.

If, then, abnormal uterine hemorrhage be nothing but a variation of the normal and we wish to bring about its cessation, the logical procedure is to destroy the one essential element in the menstrual cycle, namely the graafian follicle. It has been shown that next to the lymphocyte and spermatozoa, the ripe graafian follicle is the most susceptible to the action of the *x*-ray and radium. It needs but a step then to apply these agents to the graafian follicle to bring about the cessation of the normal or pathological uterine flow. The ripe follicle is very much more susceptible than is the primordial follicle, and if the dose may be possibly regulated to destroy only the follicles of an advanced degree of development, then a fairly definite period of amenorrhea could be brought about, depending upon the number of primordial or immature follicles remaining after the exposure.

Uterine hemorrhage is often accompanied by gross anatomical changes in the uterus, and an incomplete analysis concerning such cases, which I am now making, shows that in only four groups of conditions does there seem to be any peculiar association between the hemorrhage and the pathological change. There is a rather low percentage of hemorrhage with acute pelvic inflammation. There is a somewhat greater percentage of cases of hemorrhage with retroversion of the uterus, although in this type of case the retroversion is associated with other conditions such as cystic ovary, infantile uterus, etc. However, the reduction of the retroversion has relieved the bleeding in a fair percentage of cases, although in the majority of the cases this procedure has had a negative or only a temporary effect. The cause of the bleeding in these two conditions is still doubtful. It may be that active or passive congestion exerts a mechanical influence in the causation of excessive bleeding, but cases presenting a much more severe congestion of the uterus and cases of hypertension, unassociated with excessive bleeding, cast some doubt upon this factor and make us lean more on the theory of a disturbed function possibly brought about by the disturbed anatomical relationships —nervous irritation, ovarian circulatory disturbance. The third group includes the ulcerative conditions—carcinoma, polyps, pedunculated submucous fibroids, erosions. These, when operable, are so clearly without the realm of radiotherapy that they will only be mentioned.

The fourth anatomical condition associated with excessive uterine bleeding is fibromyoma of the uterus. There is no doubt as to the definite coincidence of these two conditions. The causal relationship, however, is still obscure. That menorrhagia may be coincident with a fibroid without any causal relationship, and may recur after the fibroid has disappeared

without recurrence of the fibroid is illustrated by the following case.

CASE I.—A woman forty-six years of age was admitted with severe menorrhagia of several months' duration. On examination she was found to have a fibroid measuring about 8 cm. in diameter. She was given 625 milligram-hours of radium intrauterine, filtered with one millimeter of brass, after a curettage. Amenorrhea ensued after four periods, persisted for eight months and was followed by a recurrence of the bleeding. On admission about a year after her first radium treatment, examination showed a grossly normal uterus. She was again treated with one thousand milligram-hours of radium not filtered.

The interesting question that arises from this case, aside from the effect of the dosage, is what relation the fibroid had to the uterine hemorrhage when the latter reappeared in the absence of the former. I cannot help but feel that there was a mere coincidence in the presence of a fibroid with a typical functional menorrhagia. Furthermore we had one case of menorrhagia unrelieved by myomectomy; and two cases in which the onset of the excessive bleeding followed myomectomy.

On the other hand, a long series of cases of excessive uterine hemorrhage relieved by myomectomy shows that there is some causal relationship between some fibroids and the bleeding. Be that as it may, it would seem that the fibroid would exercise a contributory rather than an essential rôle in the uterine hemorrhage, because in no case of fibromyoma treated by radiotherapy has there been any more difficulty experienced than has been encountered in the treatment of grossly normal uteri.

As to the mechanism by which the fibroid is diminished in size, three theories are offered. The first, and probably the most important, is that the fibroid shrinks in the same manner as do those fibroids which are present in women who have passed the menopause. The second theory is that there is a direct action upon the smooth muscle cells by the rays, causing them to degenerate and become replaced by connective tissue. The third theory is that the endarteritis caused by the *x*-ray is severe enough to starve the myomatous growth.

That amenorrhea may have more to do with the shrinking of the fibroid than direct action on the mass or starvation by obliterated vessels may be perhaps demonstrated by the following cases.

CASE II.—A fibromyoma of about ten centimeters in diameter was found in a woman thirty years of age who was suffering from severe menorrhagia. Operation although preferred was counterindicated. Therefore roentgenotherapy was instituted. There was a total dosage of three thousand milliampere minutes (given as indicated below) in two sessions a year apart. The first fifteen hundred units stopped the menorrhagia so that the patient had seven scant periods during the course of the year before the hemorrhage recurred, but the fibroid remained unchanged in size. The second dosage produced a permanent amenorrhea for a few months. The size of the mass has not since been noted.

CASE III.—A woman of thirty-six was given four hundred milligram-hours of radium, filtered through one millimeter of brass. This caused a great diminution in the amount of the uterine bleeding for about four months. The bleeding then became more profuse, and the patient chose hysterectomy rather than repeat the radiotherapy because she was afraid she had a cancer, although this had been excluded by curettage. The uterus showed a very constant endarteritis. The muscle tissue in part was replaced by connective tissue.

The interesting point to be noted in these two cases is that, even with a large *x*-ray dose, the fibroid remained unchanged while menstruation persisted. The dosage is sufficient, in a woman of forty or more, to produce a permanent amenorrhea and to cause a pronounced or complete shrink-

age of the fibroid. In the second case, while no myoma was present it was clear that the profuse blood outpouring from the endometrium was not hindered by the sclerosis in the vessels.

Further evidence against the theory of tumor starvation by occluded vessels is presented in the so-called myopathic hemorrhages mentioned above, where excessive bleeding occurs in a uterus more sclerosed than those affected by the rays. Direct observation on the chick's heart indicates that smooth muscle is particularly unsusceptible to radiant energy. Fibroids treated by roentgenotherapy in young women usually resume their growth when menstruation becomes reëstablished. On the other hand, fibroids shrink more rapidly after the artificial menopause than in the normal. Moreover, certain fibroids which have continued to grow after the normal menopause have been reduced by *x*-ray. What influences the constitutional changes, such as lymphocyte destruction, stimulation, or the elaboration of substances caused by the breaking down of susceptible cells, may have is still a matter for study. Whatever importance these processes have, there is one effect necessary for the satisfactory reduction of a fibromyoma, and that is some degree of amenorrhea.

Before taking up the matter of the application of the rays to the conditions mentioned above, it is best to try to illustrate as well as possible what is meant by dosage. With the roentgen ray, which in this form of treatment is now given almost entirely through the abdominal wall, the erythematous dose is of course the standard. A dose just short of this is given through as many portals of entry as seems practical, the number differing according to the ideas of the particular therapeutist. The number of openings through which I have directed the cross fire is determined by that size of opening through which I feel reasonably certain of directly attacking an ovary with the rays. This is a square measuring six centimeters. About seven of these areas fit below the umbilicus. Through each buttock and through the sacrum three more areas are provided, making ten in all. Ten erythematous doses through ten such areas, each dose directed at an ovary, constitutes a series. Each area of skin is given a rest of about three weeks, is exposed again, rested again three weeks and again exposed. Such a dose is practically sure to produce a permanent amenorrhea in a woman in the neighborhood of forty.

What a partial dose may be is more difficult to ascertain. Two women of over forty have been made permanently amenorrheic with two-thirds the above dosage. On the other hand several others who have interrupted the treatment at the same stage have had their periods return. In young girls the partial dosing is almost as difficult to determine because of the apparent variability in susceptibility in different individuals. This may be illustrated by the two following cases.

Case IV.—A girl of sixteen suffered from metrorrhagia for two years. Various operations were unsuccessful. Hysterectomy was the last resort, with the exception of roentgenotherapy. The complete three series as indicated above had no effect upon the bleeding until acetone was applied to the endometrium. The patient was regular for six months, when severe metrorrhagia recurred. Six hundred twenty-five milligram-hours of radium in the uterus caused a partial amenorrhea (six periods in a year), when metrorrhagia again appeared. Six hundred twenty-five more milligram-hours were applied and the patient is still amenorrheic after a short period.

Case V.—A girl of fifteen suffered from severe metrorrhagia for a year, the duration of her menstrual life. She was given one-fifth the *x*-ray dose given to the previous case, her periods became regular and stayed so for four months when she had another hemorrhage. The dosage was repeated, her periods were regular for three months, then skipped for four months

and have been fairly regular but scant for eighteen months.

In neither case were there any menopause symptoms. The dosage in the first case was nearly ten times as great as in the second and the result, if anything, not quite so complete.

With radium a permanent amenorrhea may be promised in women over thirty after applying in utero fifty milligrams unfiltered for twenty-four hours. When twenty-five milligrams are inserted for twenty-four hours, there is likely to be a return of menstruation after a time in older women and almost certainly in women under thirty, especially if it is filtered with a millimeter of brass. See Case I.

The problem of applying the above dosage to the conditions mentioned is one whose difficulties fall rather more upon the gynecologist than upon the radiotherapeutist, and in the majority of cases the two should work with mutual knowledge and sympathy. The ideal arrangement is to have the gynecologist properly equipped to carry out any procedure necessary, whether operative or roentgenotherapeutic. If it be admitted that it is possible and feasible to produce with a reasonable certainty a permanent or partial amenorrhea in the conditions mentioned above, and that, further, the rays will cause a fibroid to shrink to a satisfactory degree, or even to disappear, so as to evade the examining finger, the problem becomes one of selection in the first place and of dosage in the second.

Excessive hemorrhage in the grossly normal uterus is due to a disturbance in the proper balance between the various elements controlling menstruation. The ideal treatment is to restore that balance. In the bleeding of young women the disturbance is one of development, and every effort should be made to restore this balance by general treatment, by endocrinological study and treatment, trying to replace the deficient factor, or even by simple curettage, although improvement follows the latter in only about ten per cent of the cases so treated. Radiotherapy acts by destroying the graafian follicles and is not the ideal treatment, because it must be assumed that the ability to reproduce must be undisturbed wherever possible. When, however, the bleeding becomes so severe that hysterectomy is threatened, radiotherapy is by far the method of choice. In women under thirty partial amenorrhea can be promised, and in women between thirty and forty, it can be accomplished with somewhat greater difficulty but, in most instances, certainly. In this latter group, however, the promise of a return of menstruation must be given with caution, because even after small dosage a permanent amenorrhea may be produced, due no doubt more to the occurrence of a premature menopause than to radiotherapeusis. Such a case is the following.

Case VI.—A woman of thirty-four suffered with menorrhagia and metrorrhagia for two years, being incapacitated for one year. She was given two-thirds the dose mentioned above as necessary to produce a permanent amenorrhea at the menopause age. She had two periods thereafter and has been amenorrheic since—two and one-half years. While her health is perfect and she has been able to resume her activities as superintendent of a metropolitan hospital she, nevertheless, had a few hot flushes during the first year and is distressed with the idea of being unable to have children, although there is no actual desire for them.

With *x*-ray a single series as described above is given after each period. If the next one be excessive the dose is repeated. With radium six hundred twenty-five milligram-hours intra-uterine, without filter, is safe in women under thirty. Over that the dosage is best cut down by a millimeter of brass.

In women near the menopause age—thirty-eight or over—radiotherapy becomes a method of choice because the menstrual balance is disturbed by the approach of old age and the cessation of the child-

bearing period, probably as a consequence of the decadence of the ovarian function. Since the natural menopause is imminent it seems logical to precipitate it and to save the woman months and even years of partial or complete incapacity because of her uterine hemorrhage. In such cases a massive dose is indicated from the start.

The treatment of bleeding associated with retroversion is very much like the above. The deformity should be replaced in all cases, if possible, without operation, and the effect upon the bleeding noted. In younger women, moreover, operation should be performed if reduction fails. In older women, however, if there are no other symptoms from the retroversion, it seems fairer to leave the displacement alone, because the reduction of such displacements in older women has not, in my experiences, relieved the bleeding. In these women radiotherapy should be instituted at the outset.

The excessive bleeding associated with fibromyoma of the uterus cannot be treated alone, but must be considered along with the whole question of the proper treatment of fibromyoma. Before the use of roentgenotherapy there were certain principles governing the treatment of fibroids. The first of these was that the fibroid itself was not a menace and caused no damage except by its size, that it did not change from a benign tumor into a sarcoma. Secondly, such a fibroid should not be treated except when it gave symptoms, because sarcoma is so rare that operating on it on mere suspicion would harm more individuals than it would help. The symptoms for which operation was advised were, in the first place, excessive hemorrhage, secondly, various symptoms due to pressure on nerves or organs and, thirdly, rapid growth or large size of the tumor mass.

With the advent of radiotherapy the problem remains very much the same. The new problem is again concerned with the selection, out of those needing treatment, of the fibromyomata which are suitable for radiotherapy, and of those cases which should be operated upon. As above stated, the results to be expected from radiotherapy are, first, cessation of the bleeding, and, second, the shrinking of the growth. This shrinkage requires varying lengths of time in different cases and, in my opinion, should receive scant consideration from the radiotherapeutist. If a mass is pressing upon any organs or if it is of extremely large size, say over fifteen centimeters in diameter, and if the patient be an excellent operative risk, the mechanical removal of the mass seems the better treatment at the present stage of our knowledge.

Hemorrhage is the symptom *par excellence* that should be treated by radiotherapy in those women in whom a permanent menopause is acceptable. In younger women, say up to the age of thirty-eight, radiotherapy becomes less satisfactory because, in them, the menopause symptoms must be considered unsatisfactory even if they do not in any way incapacitate. Radiotherapy should in this class of patients be reserved for those in whom an operation is counterindicated, being particular, however, to raise the standard of operability and to pay stricter attention to counterindications which would, in the days before radiotherapy, have been considered negligible. While the menopause symptoms are not desirable, they are to be preferred to any real operative risk, and can be fairly well controlled by organotherapy. If radiotherapy is applied to a case with fibroids the dosage should be complete because, while the mass and bleeding may be controlled by frequent and continued small doses, nevertheless the prolonged attendance necessary produces a worse mental state than does the menopause. Moreover, a carcinoma, although excluded before the beginning of the treatment, may creep in to destroy the patient.

In the discussion pro and con concerning the merits of radiotherapy in the

treatment of fibromyoma several objections have been raised.

Doubt has been expressed of the results as reported. Unfortunately, such doubts are vague, and only in exceptional instances accompanied by specific examples. In the cases so far treated in this clinic, the only failures have been those following insufficient doses. One of them was operated upon, the second received insufficient *x*-ray dosage and was cured in another institution by radium, the third received insufficient radium dosage and was cured by further *x*-ray treatment. All of these cases received their treatment about a year and a half ago when too confident attempts at partial dosage were being made.

The second objection is that the results are obtained only after long periods of treatment. With radium the treatment does not prolong the time necessary for the diagnostic curettage, a matter of a few days. *X*-ray treatment can be completed in six weeks. Unless the patient be incapacitated by her bleeding she will lose practically no time during the course of the treatment. The improvement in the blood picture is immediate after the radium treatment and comes only a few weeks later after *x*-ray treatment. Comparing these results with those following hysterectomy I think that any one who has consistently worked in a follow-up clinic will not question, in these respects, the superiority of the lesser over the major procedure.

The most important objection to the use of radiotherapy is that a malignant tumor may be overlooked. Unfortunately, the word malignant tumor is promiscuously used in such criticisms. It is true that a sarcoma may be overlooked, but it is agreed that the occurrence of sarcoma is very rare—less than one-half of one per cent—and that it may, except in the case of a rapidly growing tumor, be neglected in determining the proper treatment. Greater stress is laid on the coincidence of carcinoma or epithelioma with fibromyoma—about five per cent of the fibroids. The claim is made that the neglected cancer in radiotherapy goes on to its fatal termination, whereas the cancer discovered in the specimen after hysterectomy has been performed will have no harmful consequences.

I cannot strongly enough repudiate this attitude. A malignant epithelial tumor of the uterus is readily accessible. No matter what the form of treatment outlined for the fibroid, it must be altered when the cancer is discovered. In this clinic an examination under the anesthetic with curettage precedes the further treatment, whether it be hysterectomy or radiotherapy. If the curettings are suspicious, a frozen section is made and the exact diagnosis established. In two cases in our series an unsuspected carcinoma has been disclosed, and the proper complete operation performed. I wish to repeat that a carcinoma discovered after either radiotherapy or any operation demonstrates a faulty diagnostic procedure.

The next objection is that the fibroid may "become malignant." Again unfortunately the word malignant is promiscuously used. Theoretically a myoma may become a sarcoma, but evidence is very scant that such has occurred. That a fibromyoma could become carcinoma is of course not to be thought of. Whatever mesoblastic tumors may become hypoblastic, the uterine tumors are not amongst them. If the fibroid had a chronic irritative activity, there should be a greater incidence of carcinoma among fibroids, where, as a matter of fact, it is about the same as that given for women in general.

Summarizing the above discussion, it may be said that:

1. Menstruation is directly dependent on the graafian follicle.
2. Variation in duration, amount, frequency and periodicity, when they tend to excess, give menorrhagia and metrorrhagia.
3. The destruction of the graafian follicles

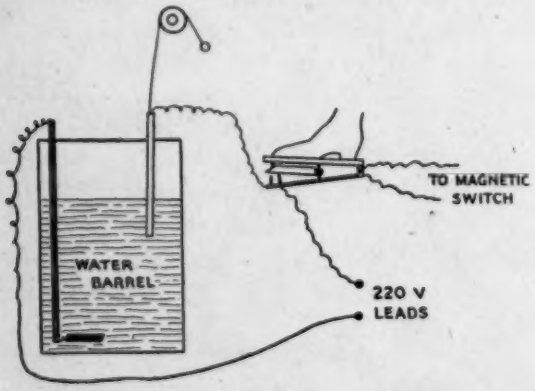
causes a cessation of either the normal or pathological bleeding.

4. The *x*-ray, or radium, depending on the dosage, destroys the graafian follicles, affecting the fully developed more than the primordial, and thereby causes the uterine flow to cease.
5. The uterine flow is made to cease in the same manner even if it is associated with gross changes, such as retroversion and fibromyoma.
6. In functional menorrhagia and metrorrhagia, in women near the menopause age, radiotherapy is the method of choice, while in younger women it should be used with caution.
7. Fibromyomata shrink, and the uterus ceases to bleed after proper radiotherapy. They should be treated only when giving symptoms. Those tumors occurring in women in whom a menopause is acceptable are proper subjects for radiotherapy, if pressure symptoms are not severe; if the mass is not rapidly growing; or if it is not of excessive size. The menopause should be permanent.
8. The presence of carcinoma of the uterus should be excluded before treatment of any kind is given for uterine bleeding in women over thirty, whether a fibroid be present or not.

A WATER-BARREL RHEOSTAT

That those engaged in Overseas Service are frequently "put to it" to make their machines work is illustrated by the following, which is quoted from a letter recently received by the United States Army School of Roentgenology from one of its recent students.

"We have a gasolene motor running at high speed controlled by a governor. Running synchronous with it is another large motor—our rectifying motor. When a heavy current is drawn, a sudden load is put on the generator with consequent slowing up of the gasolene engine. Even if the governor works very quickly there is bound to be a slight temporary slowing of the engine. The rectifying motor revolving at a high speed cannot answer to this slight slowing on account of centrifugal action—the motor with the disc acting as a flywheel—and the motor is consequently thrown out of synchronism. Acting on this supposition, I tried to think out a remedy and am now using the following:



"I made a large water-barrel rheostat, in which I can control the load from five to thirty amperes. This load is always on the generator. In the circuit is a heavy duty foot switch, on the other side of which is a button switch, controlling the magnetic *x*-ray switch. These are so arranged that one is always on. The one contact is made just as the other is broken. The water-barrel load is adjusted to the amperage that my *x*-ray will take by lowering the iron rod in the water. The generator has always the same load—either the water-barrel load of say 20 amperes or the *x*-ray load of 20 amperes. The change is practically instantaneous, and the gasolene motor runs at the same rate. Even the ammeter does not show any fluctuation. Working with this arrangement, we have been able to get 60–70 milliamperes with excellent results."

TUBERCULOUS ADENITIS AND ITS TREATMENT BY ROENTGENOTHERAPY *

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IN THE treatment of tuberculous adenitis the first and most important consideration is that it is a local manifestation of a constitutional disease. Therefore, any method which treats only the local lesions is efficient only when it or nature or both conjunctively are able to combat the constitutional disease. End results in the treatment of tuberculous adenitis by roentgenotherapy are superior to those produced by any other method, because radiation is a local as well as a constitutional treatment. Twenty-five to fifty per cent more cases are permanently cured by this than by surgery alone, and a few surgeons have stopped operating entirely.

Roentgenotherapy is a method which never spreads the tuberculous process, leaves no deformity, and, during the treatment, the patient always gains in weight and general health. These statements cannot be made too emphatic, because a number of therapeutists have treated over 500 cases of tuberculous adenitis with over ninety per cent of cures.

To-day a surgeon is not justified in operating on tuberculous glands before roentgenotherapy has been employed and then in only a small percentage of cases. The reason some surgeons have been slow in referring these patients for roentgenotherapy is that no surgeon sees or operates on many cases in a year and his experience is rather limited. In fact tuberculous adenitis is a side issue with most surgeons and many of them are following the old methods without realizing the results which are being obtained with roentgenotherapy. It is not ignorance, prejudice or commercialism, as many claim, because lately many prominent surgeons, who in the past had been doing extremely radical operations, are referring tuberculous adenitis for roentgenotherapy.

Lack of wider knowledge is really our fault in being slow to report our cases, and the surgeons have seen only a few of the cases treated, in most of which the treatment was unfinished and incomplete. There is a small per cent of cases, five or ten per cent, where it is advisable to remove the fibrous nodules after radiation. Frequently, when the surgeon is consulted, he may declare the treatment a failure without realizing that the patient is practically cured. If such nodules are removed and examined when the treatment has been efficient and complete, they are found to contain little or no tuberculous material, the fibrous stroma of the glands remaining. Many of the laryngologists are referring tuberculous adenitis from roentgenotherapy as a routine procedure. It will be only a question of time until roentgenotherapy will be universally adopted as a method of choice.

In the past the treatment accorded tuberculous adenitis depended largely upon the physician first consulted. There have been the hygienic, medical, roentgen ray, radium, light-therapy, vaccine, laryngological and the surgical treatments. Light-therapy is too superficial to affect the deep-seated glands, and any results obtained are by the effect on the general health of the patient. Tuberculin, as a whole, has been rather unsatisfactory and since by roentgenotherapy we are able to produce an effect almost identical to that produced by a supposedly successful tuberculin treatment (the rays apparently producing an autogenous vaccine as well as

* Read before the Roentgen Society of Central Pennsylvania, and Clearfield, Elk and Jefferson Co. Medical Societies, DuBois, Pa., June 11, 1918.

destroying the adenoid tissue) it would seem that vaccines are seldom ever indicated in the treatment of tuberculous adenitis, nor will be until we have a more accurate method of prescribing them. The local applications of iodine, belladonna, mercury or ichthyol are useless.

Prophylactic treatment is important, and has not received proper attention. Persons having unhealthy tonsils, adenoids, nasopharyngeal catarrh, bad teeth, etc., are predisposed to tuberculous adenitis. Until recently very little attention was paid to the source of infection. An effort should always be made to locate the channels of infection, although a great many cases are cured without finding the primary focus. Many are not removing the tonsils, adenoids or bad teeth until the disease is well localized on account of the danger of spreading the infection.

Surgical treatment in the past did not comprise any one single method. One surgeon would drain abscesses, another would inject antiseptics, another would excise glands unless there was an abscess, and another would excise both the glands and the abscess. Some hesitate to operate until a sinus is healed while others disregard that entirely. Some difference has prevailed as to the extent of the operation, whether to remove the entire chain or to remove only the main glandular mass. As a rule, in general practice the physicians have waited until suppuration takes place. So in a large majority of cases, the surgeons do not see the patient before the formation of an abscess. A lung tuberculosis should always influence the treatment. I am sure a certain number of patients have lung involvement following operations, particularly if performed before the process is well localized. Lately, surgeons are beginning to consider this very important fact.

In reviewing the literature one is rather forcibly confronted by the fact that there are only about four or five surgeons who have contributed much to the surgical form of treatment of tuberculous adenitis and that the number of patients they have reported are small compared to those who have been treated in the various roentgen laboratories. Also there are very few papers published on roentgenotherapy. This is a criticism which is attracting the attention of the roentgenotherapeutists. Injudicious surgery in the past has accounted for the notion that the surgical treatment is inefficient and that glands recur at the site of a previous operation, so that when operation is advised it is looked upon as but the beginning of a series of operations.

Mathews' remarks in regard to the treatment of tuberculous adenitis are worthy of careful consideration, and he gives his objections to surgery as follows: "first, children, at least, get well without it; second, we have no certain method of diagnosis in the early cases; third, we cannot remove all the affected glands; fourth, scars; fifth, recurrence." Mathews continues: "I wish to advocate the earliest possible removal of an isolated glandular focus both in children and adults, for the following reasons: it is local at first and can be removed with slight scarring and without sacrificing important structures. Hygienic treatment is always important but will be more successful after the removal than when the tuberculous glands are present."

You will undoubtedly agree with Mathews that we are not absolutely sure when the tuberculous foci, even in the early stage, are localized. Since this is true and since the disease can just as successfully be removed by the roentgen rays with no danger of spreading the disease, without scarring and without sacrificing any important structures, complete extirpation of tuberculous glands should never be performed until the disease is well localized. Past experience and present results with roentgenotherapy should at least make every one advise this method, at least for its localizing effect.

In some clinics more than one thousand cases of tuberculous adenitis have been

treated by roentgenotherapy, and operation was required in less than ten per cent of the cases even for the removal of the fibrous nodules, over ninety per cent being cured by radiation alone. All agree that the rays cause a disappearance of the adenoid tissue, leaving only the stroma. It is generally agreed that after roentgenotherapy, in most cases the nodules disappear entirely, while, in a small percentage of cases they remain small and hard. If these nodules are removed and examined there will be seen a central cheesy mass surrounded by connective tissue in which there is no tuberculous material. A total disappearance of adenoid tissue is noted.

I have observed the cervical glands undergo a calcareous degeneration following radiation that left the glands so dense that a roentgenogram disclosed the shadows plainly like those seen in the chest following nature's cure of a tuberculous process. One or two glands may be seen above the clavicle in old tuberculous cases, but never the number seen in this roentgenogram. Really radiation cures the glands in the same manner as nature, except that it does it so much more quickly. A sclerosis of all the glands with an entire obliteration of all adenoid tissue can be produced in every case if the treatment is properly given, just as certainly as fire will boil water. Any degree of local destruction of the lymphatics can be produced if the operator knows how.

Different authorities call attention to the fact that when the older methods are employed a certain per cent of the patients ultimately acquire pulmonary tuberculosis. This possibly never occurs when radiation is given before any lung involvement takes place. For this reason the medical treatment should not be persisted in too long without roentgenotherapy.

Large glands due to an inflammatory process are frequently secondary to a septic condition elsewhere and a search should be made for the primary lesion. When this is found and treated, if the glands remain large, and particularly if they show a tendency to suppurate, roentgenotherapy should be employed at once. If they are given treatment promptly and properly, suppuration can nearly always be avoided.

I do not favor opening a tuberculous mass as soon as it begins to soften, as many advocate. A few roentgen treatments given first greatly facilitate repair of the parts, and the sinus which frequently follows will not be so deep and will heal more readily. Certainly nothing is slower to heal than a sinus leading into a gland which has been opened just as suppuration was beginning.

It is a well-known fact that we have no better treatment than roentgenotherapy for carbuncles, boils or any other of the localized pus infections. Then why be in such haste to open a tuberculous abscess before it begins to bulge? Under roentgen treatment they are never painful. This brings up the question, do the rays produce an immunity both to tuberculous and mixed infections? I am sure that susceptibility to the development of tuberculosis is always greatly lessened after a few radiations and that the patient in some cases at least is rendered immune.

Recent investigations regarding tuberculosis and the various processes of tubercular infection lead to the conclusion that tuberculosis has three stages. The first stage is the infection of the glands, usually coming in childhood; the second is the infection of the bones and joints; the third, infection of the lungs.

There is no longer any doubt that the lymphatic glands form the first line of defense against tuberculosis. Nowhere is this so well demonstrated as where the glands of the neck are invaded, because almost invariably the virulence of the bacillus is greatly lessened after its entrance into the glands. In many instances the disease does not become general, so that many patients recover in a way that shows truly this infection is arrested. These tumors may spontaneously subside without suppuration, while in other patients

the disease progresses until fluctuation shows that suppuration has taken place in the glands. Constitutional infection is not uncommon, when tuberculous glands are neglected. Therefore, a patient with chronic enlarged glands in the neck should have treatment before the constitutional symptoms develop. In the past this has not received sufficient attention. We see too many cases coming late where the glands have been enlarging for a year or more. Such neglect often necessitates longer treatment and may even endanger the life of the patient.

We frequently see a case of tuberculosis of the glands followed later by tuberculosis of the bones and, finally, there is an extension into the lungs. In some individuals the process is checked in the bones or joints. The process then becomes very chronic, the resistance of the patient being sufficient to end the infection. Therefore, it should be our aim to destroy the disease while it is a primary infection in the glands.

By radiation the local disease can be removed and the removal of the hypersusceptibility prevents an extension of the disease. The healing of the process or local lesion is by far less important than preventing a spreading of a general tuberculosis. Tuberculin has been given for this purpose, but experience has shown that, unless we are able to give the proper dosage with the proper intervals, more harm than good is done. In the future, tuberculin may be used with greater success. We must remember the great responsibility of checking the disease in the primary stage and treat the glands by roentgenotherapy as soon as discovered. It should be apparent to every one that the removal by radical surgical operation is contra-indicated, and when a recurrence takes place, not on account of the lack of surgical skill, but because of the presence of tubercle bacilli which are beyond reach of the knife, the organism is rendered more susceptible, giving the disease a greater chance to spread than before the operation. The hypersusceptibility is greatly increased by anything which tends to lower the vitality of the patient.

Tuberculous glands have been classified with regard to the pathological involvement. Closed glands are found in two varieties, the hyperplastic and the fibrous. In the hyperplastic type the glandular substance increases together with the stroma. In this variety, if left untreated, the glands soon liquefy and form an abscess known as soft glands. It may remain a long time, but, if left untreated, a tryptic ferment will digest the capsule, finally reaching the surface and producing an unsightly scar. Fibrous glands occur in individuals who have a greater resistance; the tuberculous process is slower, and the glandular material is not increased in the same ratio as the fibrous tissue. In the fibrous variety, nature is almost curing the patient. If the fibrous tissue does not entirely absorb, it will frequently leave a hard nodule the size of which depends upon the number of glands.

Cicatrized glands are enlarged glands where the tuberculous process has been healed by the formation of scar tissue. If the glands have attained great size before roentgenotherapy is given, a small palpable nodule will usually be left. The patient may even think there is still a tuberculous process, and even the physician may not realize that a fibrous healing takes place in the cervical glands as it does in the lungs. Particular attention should be directed to this, and the rays cannot be expected to absorb all the scar tissue which has been formed by the tuberculous process, when the glands have attained great size, or where large amounts of fibrous tissue have been formed by nature's cure before roentgenotherapy has been employed. This is always less when treated by radiation than by any other method, because the rays always absorb a large amount of scar tissue. As before stated, it has been proved that when radiation is properly given less than ten per cent of the cases will require operation for even the enlarged nodules. Then, when

operations are performed for such cicatrized glands, radical procedures are never necessary and large unsightly scars are avoided, because the operation is performed for a different purpose. The healed nodules can be removed through a small incision and closed by sutures so no deformity is left.

Open glands are those that have suppurated and opened to the surface. There are two varieties, those that break down as a result of a tryptic ferment, the discharge of which is sterile, and those which have broken down due to a mixed infection.

Recurrent glands, after a radical operation consisting mainly of mixed infections, are those recurrent immediately after the operation. These are usually of a purely tubercular character. The increased hypersusceptibility of a patient after operation is often a factor in the recurrence. Glandular enlargement on the opposite side of the neck, or anywhere else in the body, shows the increase of susceptibility after a radical operation. In these cases it is very important to begin roentgenotherapy at once and not attempt a second operation, as has been the custom in the past.

It has been known for a long time that contagious diseases increase the hypersusceptibility to a marked degree. This condition does not seem to bear a relation to the severity of the infectious diseases, as we have a much larger increase of hypersusceptibility after an attack of grippe than after the contagious diseases which one would naturally expect would emaciate the patient considerably more. We have different grades of susceptibility in tuberculous adenitis. The small closed glands naturally represent the lowest grade of susceptibility, which is explained by the fact that the glands act as filters and contain the tubercle bacilli on their route to other organs. As long as the glands do not suppurate they are successfully checking the tubercle bacilli, although they are undergoing pathological changes. When the glands have broken down they are not performing their full functions as filters and the extension of tuberculous adenitis is more likely. The results obtained by the treatment of tuberculous adenitis with roentgenotherapy leave no doubt that this method is the treatment *par excellence* for this condition.

Bonime says: "That surgical treatment is contra-indicated in every case of tuberculous glands is beyond dispute. Those who still resort to radical operation will find the responsibility harder to shoulder with the ever increasing recognition of the fact that the glands can be cured without it." While Bonime's statement may seem to some to be too strong, yet the facts produced and the results obtained by those experienced in this method of treatment of tuberculous adenitis fully justify his assertion; and what is most essential now is a wider knowledge among physicians of the positive curative results of roentgenotherapy.

In conclusion, permit me to state that the technique or method of employing the roentgen rays is very important if results are to be obtained in the treatment of tuberculous adenitis. This is not generally recognized, even by many roentgenologists, to say nothing of the general medical profession. This paper deals with the clinical side of the subject and it would be entirely too lengthy if the technical side were discussed. However, I will say that two or three full skin doses, covering the entire area, is inefficient treatment. The neck should be divided in a number of small areas and as much cross-firing as possible employed. Suitable and adequate technique for each case has produced over ninety per cent of cures without deformity.

MODIFIED TECHNIQUE FOR THE *X*-RAY TREATMENT OF HYPERTRICHOSIS

BY SAMUEL STERN, M.D.

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NEW YORK

IN *The New York Medical Journal*, January 6, 1912, I published an article on the *x*-ray treatment of hypertrichosis. This was based upon the results achieved in 100 cases treated up to that date.

The results accomplished, while quite satisfactory as regards the permanent alopecia, were rather disappointing as far as the ultimate cosmetic effect of the treatment may be considered. In practically all the cases treated, there developed a certain amount of atrophy of the skin, interspersed with more or less telangiectasis, leading in some cases to considerable disfigurement. While by various methods this condition could be partly avoided and somewhat improved, still on the whole the results accomplished were rather discouraging. So much so, that for a number of years I discontinued the roentgenotherapeutic treatment of all these cases, and depended entirely upon electrolysis for their relief. Unfortunately, in a very large number of cases, electrolysis offers very little hope. It offers practically no relief in a case where a large area is involved, especially when we have the long, fine, delicate lanugo-like hairs to deal with. Even when the hairs are coarse, where we have a very extended involvement, as in many cases—often amounting to a complete beard—to achieve results with electrolysis is practically a life job and, if accomplished, will be followed by more or less scarring—especially if the hairs are in very close proximity. Many patients cannot stand the pain accompanying the treatment; so while electrolysis may be used with good results in cases with a limited number of hairs, there are a large number of cases where it cannot even be considered. The mental suffering of these patients cannot be overestimated. I know of no dermatological condition that can be compared with it. I have seen them on the verge of melancholia and insanity, brooding over their condition, threatening suicide, shunning the light, and avoiding their friends, leading a very morbid and miserable existence indeed. To such an extent, that in many cases something must absolutely be done to save them from themselves and to turn them into useful members of the community.

So about three years ago, unable to withstand the pressure of persisting, family physicians and imploring patients, who were willing to exchange their ailment for almost any other kind of disfigurement, and who were willing to accept all responsibility, I decided to try a modification in *x*-ray treatment, which I hoped would prove more satisfactory. This modification consisted in producing epilation by the use of *x*-rays of very deep penetration, filtered through 4 mm. of aluminum and other filters, thereby filtering out all the soft rays —those that are absorbed by the skin, and which most probably play the important part in the production of skin atrophy and telangiectasis. In hospital and private practice, up to date, I have treated 74 cases with this method and the object of this paper is to describe the technique and the results achieved.

Choice of Cases.—This is limited entirely to cases in which something must be done, and where electrolysis for one reason or another cannot be utilized. Before treatment is begun we must explain to the patient the period of time over which the treatment must be persisted in, the possibility of the development of telangiectasis and pigmentation. The patient must assume the responsibility of these developments, and only when we feel convinced that nothing that may develop from the treatment will cause more mental suffering than the condition for which they seek

relief are we justified in advising the treatment.

Technique.—We can most conveniently divide the face, for the purpose of treatment, into five areas: left side of face, right side of face, chin, left upper lip and right upper lip.

In applying our protection we must be extremely careful to avoid overlapping. It is always preferable to treat these patients in a lying-down position, with the entire body protected, and only the part to be treated exposed to the rays. In protecting the adjacent areas with lead rubber, it is advisable to place a thick piece of gauze under the sharp edge of the rubber. The object of this is to prevent a very sharp line of demarcation in patients where the exposure is followed by more or less hyperpigmentation. By doing this we find that the pigmentation merges with the skin more gradually and is not as marked as it would be otherwise.

The tube used is a Coolidge tube with a penetration backing up a 9-inch spark gap—about 10 Bauer.

The filters used are 4 mm. aluminum attached to the tube stand and a number of layers of thick photographic paper and a loofah sponge, placed over the area to be treated. The object of this is to filter out the secondary rays generated in the aluminum filter.

The tube stand is carefully grounded and is tilted at a suitable angle to permit the rays to enter the follicles as directly as possible.

The Dosage.—The success of the treatment depends entirely upon the administration of the proper dosage. In working with unfiltered or lightly filtered rays the epilating and the erythema dose are practically synonymous. With highly penetrating and heavily filtered rays the epilating dose is a little below that of the erythema dose. To expect satisfactory results in the treatment of these cases, we must never go beyond the epilating dose. We must avoid producing even the slightest blush. We must very carefully standardize our apparatus, find out what our epilating dose is and use that as our standard. This will differ considerably with the apparatus used. It is impossible to give the epilating dose in figures of X, as this seems to differ with the different types of machines. A certain number of X with a machine worked with an interruptor seems to produce a more intense effect than the same number of X from a transformer—at least this has been my experience. Besides, our different methods of measurement are still rather inaccurate and give very varying results. It is useless to attempt to measure highly penetrating and filtered rays with Kienboeck stripes. This method was only intended to measure medium, unfiltered rays; with any other kind of rays the measurement will be most inaccurate. In using the other measurements in vogue, we find that the same exposure will give a different reading, depending upon the method used. For instance I found on repeated experimentation that where a test exposure gave me 50 X on a Sabouraud & Noire pastille, it registered 32 X on a Holzknecht radiometer and also 32 X on a Hampson.

The only satisfactory method is to work out a set rule for your apparatus, never vary this, and work with a unit of fraction of time. With the apparatus I use under certain set rules, I get an epilating dose in 10 minutes; so I use this as my unit, and have no difficulty in administering fractional doses by simply using a fraction of the 10 minutes.

In cases where the entire face is involved, where we have five areas to treat, I find it most satisfactory to treat at the rate of one area each week. This enables one to treat each area once in five weeks, which is about the frequency with which they should be treated.

The first dose administered is an epilating dose. If five weeks later there has not been a complete epilation and no untoward results have developed, another full epilating dose may be administered. After a complete epilation, if treatments were discontinued, the hairs would return in about

two or three months, but this can generally be postponed by giving them an exposure at regular intervals for a period of about one year. At the end of this time, the hairs as a rule do not return, or if they do, they generally return as small white hairs, not very noticeable and so lightly attached that merely touching them will sometimes make them fall out. If the patient finds this condition still objectionable, an occasional treatment at long intervals—about once in three months—may be persisted with.

The dosage given is gradually diminished as time goes on. The first dose after epilation is complete—if there is no reason to the contrary—is about three-fourths of an epilating dose, and the balance of the exposures will be between that and half of an epilating dose—that is, providing there is no sign of recurrence. If there is, we must promptly return to a full epilating dose again. The important thing is to get along with using as little *x*-ray as possible, and never to go beyond the amount necessary to produce epilation.

Complications Arising During Treatment.—There are a number of symptoms that occasionally arise during the course of treatment, the significance of which we should be familiar with. In treating the side of the face, patients sometimes complain of slight neuralgic pain developing in the region of the maxillary bone. This usually lasts but a short time—probably one or two days—is generally not very annoying and promptly disappears without any treatment. Sometimes a slight blushing appears over the area treated, shortly following exposure. This is due to the effect of the secondary rays produced in the aluminum filter. It lasts probably a few days and can be very much shortened by the application of the alkaline lotion suggested by the late Dr. Dodd. This lotion, the formula of which is

Zinci Oxidi	℥ ss
Acidum Carbolicum	℥ ss
Glycerinum	℥ i
Aqua Calcis	℥ viii

may be used methodically throughout the entire treatment to great advantage, as a safeguard against the development of dermatitis. It should be well shaken and mopped every night, or oftener, over the treated area. It drys on the skin in the form of a white powder, and is not at all objectionable to the patient. If at any time during the course of treatment an *x*-ray dermatitis develops, no matter how slight, treatments must be promptly discontinued and the lotion above mentioned used as frequently as possible. Even after the dermatitis has disappeared, it is best to stop treatments altogether over the area affected; other areas may be treated, depending entirely upon the judgment of the operator.

Hyperpigmentation develops quite frequently, especially in patients with a dark olive complexion, sometimes after the first epilating dose. When this occurs, it is best to wait until it fades out before the next dose is administered. This generally takes a month or two. In other cases it does not appear until towards the end of the treatment. The latter type is much more persistent, but I have found that even this has a tendency to get lighter in course of time. We might use desquamating lotions to hasten its disappearance, but one should not use the ultra violet light to remove the pigmentation, as this light generally aggravates the condition.

In treating the chin and lower jaw, we frequently get swelling of the salivary glands. This may be very slight, lasting but a day or two, or it may be rather severe, bringing about almost a complete cessation of the salivary secretion. These cases are often accompanied by annoying constitutional disturbances, which persist over a considerable period of time. In the light cases there is no objection to resuming treatment at the regular time, with a diminished dosage. In the more severe cases treatment had best be discontinued for a long time; if resumed at all, it should be done very carefully and with as small dosage as possible. In the very severe cases,

treatment should be discontinued entirely. In many cases the swelling of the glands is due not so much to the action of the *x*-ray as to the absorption of the electrical discharges surrounding the tube. In these we might alleviate the condition by following Pfahler's excellent suggestion of covering the part treated with very thin tin foil and grounding this.

Occasionally we have to treat other parts of the body than the face for hypertrichosis, in patients who are very anxious to get rid of excessive growth of hair in different parts of the body. I treated a number of patients for this condition affecting the lower limbs over an area extending from knee to ankle. Here we might treat each entire limb at one time, dividing it into four or six areas and giving each area a full epilating dose. The after treatments are carried out as those described for the face. These cases generally do very well, but in one instance a marked lymphedema developed after a number of treatments. This disappeared after a few months and left no permanent bad effect. It was very annoying while it lasted, however, and in treating these cases we must always warn the patient about the possibility of its development. If it does develop, it is best to discontinue treatment entirely and advise rest as much as possible, with the limbs in an elevated position. Upward gentle massage and firm bandaging seem to be of decided value.

I treated several patients for the removal of hairs from the axilla. Here, occasionally, we get a swelling of the sweat glands followed by furunculosis. This is treated in the usual way, and generally gives very little trouble. The treatment of the axilla is rather difficult on account of the irregular surface it presents to the ray; the results are not very satisfactory and it should be very much discouraged.

Conclusions.—The results accomplished in the 74 cases so far treated by this modified technique have been fairly satisfactory. The great majority of cases have shown no sign of any permanent injury to the skin. Several have shown signs of telangiectasis and in some there is still a certain amount of hyperpigmentation persisting. I have not as yet seen any symptoms of skin atrophy developing in any of the cases treated. I realize that the time which has elapsed has not been sufficiently long to show all the damage that the *x*-ray may have produced, and that in course of time I may have reason to change my opinion about the ultimate results achieved in the cases treated.

To the best of my knowledge at the present time, there is not a single dermatologist or roentgenotherapeutist who does not condemn the *x*-ray treatment of hypertrichosis. I have no doubt with very good cause, for up to the time that I tried this modified technique I have not seen a single satisfactory termination to any of the cases treated. There is something about this condition that plays havoc with the mental state of many of these patients; probably, as they see the hairs grow, they look upon it as a sort of masculine sex reversion and as something that should be carefully kept a dark secret from the rest of the world. To observe the improvement in their mental state, as they see the hairs disappear, is very gratifying indeed.

Even now I realize that the treatment is far from ideal and should be reserved only for cases where something must be done, and where there is no other possible method of treatment. In such cases, in my opinion, the results not only justify the treatment, but it is our duty to employ it, to give the only possible relief to a class of patients to whom this affliction is a great burden.

A CASE OF CONGENITAL DEFORMITY OF THE HANDS, SUPERNUMERARY TOES, AND ABSENCE OF TIBIÆ

BY ARTHUR J. DAVIDSON, M.D.

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PHILADELPHIA, PA.

THE following interesting and unusual case illustrates, in the same individual, three distinct types of congenital deformity of perverted development; viz.: malformation of parts, absence of parts, and supernumerary parts.

FIG. 1. SHOWING FIVE FINGERS ON EACH HAND—NO THUMBS.

The child, R. F., a boy, was born on December 24, 1913. Was a full term baby, normal birth. He is the sixth of seven children, having four sisters and two brothers all of normal development and good health.

There is no history of any deformity in any member of the family on either the maternal or paternal side as far back as can be traced. The father and mother are normal, healthy country people, the father being thirty-seven years and the mother thirty-six years old when the baby was born.

The child was brought to the Orthopedic Department of Jefferson Medical College Hospital in April, 1916, at which time he was slightly over two years of age. He is a bright well-nourished child; has never had any illness except chicken-

FIG. 2. RIGHT HAND.
Roentgenogram by Dr. W. F. Manges.

FIG. 3. LEFT HAND.
Roentgenogram by Dr. W. F. Manges.

pox. His head and neck are well formed, chest and abdomen of excellent development and the heart and lungs are normal.

HANDS.—On each hand the thumbs are absent. There are five well-formed fingers, each about of equal length. There is a metacarpal bone for each finger. The carpal bones have not yet appeared by *x*-ray examination. The child uses each hand very well and apparently does not miss the absent thumb action.

FEET.—On each foot there are eight fairly well-formed toes. In the right foot there are six metatarsals which are of about equal development. The innermost is a little larger and the outermost is second in size. The innermost toe and the fourth, counting from the inside, have very imperfect bone development and do not articulate with a metatarsal. Practically the same condition exists on the left side except that between the second and third metatarsals, counting from the inside, there is a rudimentary one, there being present just the distal portion of the bone. The *x*-ray interpretation of the tarsus is difficult. There is a fairly well developed os calcis and astragalus and three other centers of ossification, one of which is apparently a normal cuboid. The tarsal development of the right and left foot is alike.

LEGS.—The upper leg, hip, thigh, and so forth, are normal. The lower legs are

FIG. 4. SHOWING EIGHT TOES ON EACH FOOT.

FIG. 5. SHOWING ABSENCE OF BOTH TIBIÆ, SUPERNUMERARY TOES, PERVERTED DEVELOPMENT OF TARSUS.

Roentgenogram by Dr. W. F. Manges.

FIG 6. SHOWING FIVE FINGERS, NO THUMBS, EIGHT TOES ON EACH FOOT, ABSENCE OF TIBIÆ.

very short. There is complete absence of each tibia. The fibula is present but its articulation is faulty at both ends. It articulates neither with the femur nor the astragalus. On both sides there is a distal epiphysis. There is no stability to the lower legs. The child walks with difficulty by inverting the feet and bearing the weight on the outer side of the lower leg.

COMMUNICATION FROM THE COUNCIL OF NATIONAL DEFENSE

ENROLLMENT OF PHYSICIANS

1. On August 8 the following statement was authorized by the War Department, signed by Newton D. Baker, Secretary of War:

"The War Department today has suspended further volunteering and the receipt of candidates for officers' training camps from civil life. This suspension will remain in force until the legislation now pending before the Congress with regard to draft ages is disposed of and suitable regulations drawn up to cover the operation of the selective system under the new law. * * *"

Fearing that this order might be misinterpreted by doctors who would not distinguish between enlistment as a private soldier and enrollment as an officer in the Medical Reserve Corps, on August 9 I asked the Secretary of War to issue a statement making clear this point.

2. In response to this request on August 10 the following statement was authorized by the War and Navy Departments:

"Orders issued by the War and Navy Departments on August 8 suspending further volunteering and the receipt of candidates for officers' training camps from civil life do not apply to the enrollment of physicians in the Medical Reserve Corps of the Army and the Reserve Force of the Navy. It is the desire of both departments that the enrollment of physicians should continue as actively as before so that the needs of both services may be effectively met.

(Signed) JOSEPHUS DANIELS,
Secretary of the Navy.
(Signed) NEWTON D. BAKER,
Secretary of War."

3. It is desirable that the definite attention of the medical profession be called to this interpretation in order that enrollment for the Medical Reserve Corps of the Army and the Reserve Force of the Navy which is going on so rapidly at the present time, shall not be interrupted.

I trust that you will give this prominent space in the next issue of your Journal and such editorial comment as you may deem desirable.

FRANKLIN MARTIN,
Chairman, General Medical Board.

HOLDER FOR DIRECT SETTING OF HIRTZ COMPASS

BY J. S. SHEARER, M.S.

Major, Sanitary Corps, U.S.N.A.

ITHACA, N. Y.

SINCE the article on standard methods of localization recently published in this JOURNAL was written, there has been perfected a holder for direct setting of the compass while the patient is in the position in which fluoroscopic examination was made. Detail of the holder is shown in Fig. 1. It consists of a tube fitting the screen carrier, with a square sliding rod which permits of longitudinal motion but not of rotation. The tube is held in position by a V-shaped projection on a fixed ring at *A*, and the sliding arc may be clamped where desired by the thumb nut, *D*. The compass is held in position by thumb nut, *B*, and the indicating rod of the compass inserted through the hub and holder is locked in position by nut *C*. Fig. 2 shows the mode of operation and may be briefly described as follows:

After the localization and depth determination has been made, the screen holder is removed from its socket and the compass holder inserted in position. On account of the construction the axis of the compass and its pointer will be parallel to the line of sight by means of which localization has been made. In other words, it will be vertical and parallel to the post of the screen carrier. The brass holder in which the compass is mounted is so designed that the upper portion compensates for the thickness of the slider on the arc of the compass. The arc is removed and the compass placed in position. The pointer is inserted and clamped so that the distance of the ring mark at the end of sliding clamp on the pointer rod is as far above the top of the brass holder as the projectile is below the skin mark. The end of the pointer so raised is brought in contact with the skin mark previously made, and the holder is locked so that the compass is rigidly held in position. The arms and legs of the compass are then adjusted to any desired positions on the patient's body, and all parts of the compass are locked. By means of the vertical movement of the carrier the compass may be raised an eighth of an inch or so and the marks placed directly under the feet of the compass, which is much more convenient than to make the marks first and adjust the compass afterwards.

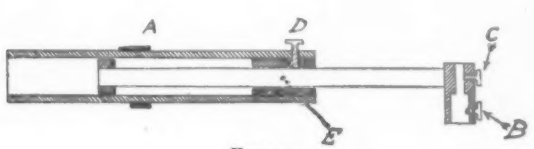

FIG. 1.

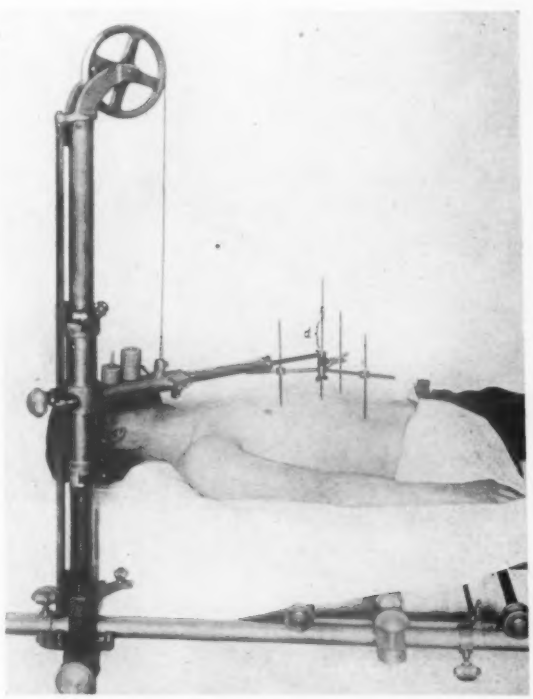

FIG. 2.

This method possesses two distinct advantages: (1) it may be done quite

expeditiously, (2) it indicates clearly to the operator how the compass is going to stand on the patient when in use. Its disadvantages are: (1) the necessity of considerable illumination in the dark room when placing the compass, (2) danger of movement of the patient between localization and final adjustment, (3) need for the compass in the fluoroscopic room as well as in the operating room. It will remain for the individual operator to decide which of the various methods is most desirable for the case at hand as no general instructions can be given.

THE LONG COMPRESSION TUBE IN ROENTGENOGRAPHY

BY CAMP C. THOMAS, B.S.

ANN ARBOR, MICH.

FOR a long time roentgenologists have recognized the value of long target-plate distances for roentgenography of the chest and objects which do not lie close to the plate. In addition to the long target-plate distances, many are using the long compression tube of small diameter. But as manufacturers are slow in placing suitable tubes in the requisite varieties on the market, we have made our own compression tubes from drawn lead pipe ferrules, twenty inches long. A cast-iron ferrule at one end of the lead pipe is used as the nozzle-end of the compression tube, stiffening it and insuring a perfect circular shadow upon the plate. The other end of the tube is soldered to a lead collar to form the attachment to the tube stand. In the case of the six-inch-diameter tube it is only necessary to bend over the edge of the tube forming a flange to fit the groove of the tube stand. With the large-diameter tubes it is necessary to use a diaphragm, Fig. 1.

FIG. 1.

We use a diaphragm having a three-inch opening with the six-inch tube. For immobilizing the patient an aluminum semisphere or an inflated rubber bag may be interposed, instead of using sand bags. This tube weighs twenty-five pounds and by its mere weight makes some compression.

The short tube is useful when confusing details of overlying structures are to be avoided as in roentgenography of the antra, frontal sinuses and mastoid cells.

The six-inch diameter tube, with compression, is convenient and efficient for examination of the shoulder, knee and hip joints, spine and chest. It makes the average target-plate distance thirty-six inches.

The greater distance of the target from the patient acts as a protection, especially where repeated examinations are made.

It is possible that in the future the chest will be examined by exposing small areas in preference to covering the whole field with the large plate. With the six-inch-diameter tube and three-inch diaphragm, roentgenograms of the lungs and mediastinum possess shadows of exquisite detail and definition, Fig. 2.

Secondary radiation is to a large extent

eliminated by the use of the long compression tube. In tubes exceeding four inches in diameter it is necessary to use a diaphragm.

The technician is sometimes careless about having the central ray strike the plate perpendicularly. With the long tubes, especially those of small diameter, this mistake is not likely to be made. As the operator does not have much shadow-space to waste, he is, as a matter of necessity, more careful about centering the tube. Thus, distortion of shadows are prevented and a more constant technique is insured.

For subjects of average size the target-plate distances are automatically fixed, which serves to facilitate the examination. As the target-plate distance is increased, the time of exposure is greater, but this is well compensated for by the greater wealth of detail and the comparative absence of distortion it ensures. For nearly all bone work we use an exposure of ten seconds with the tube passing 20 ma., varying only the spark gap by changing the rheostat or the heat of the filament of the Coolidge tube.

In conclusion we claim that the long compression tube offers the following advantages:

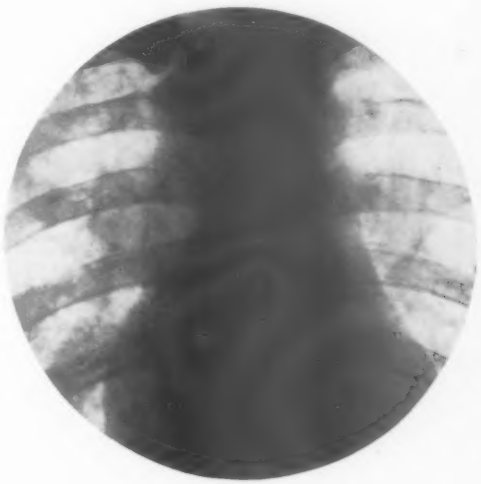

FIG. 2.

1. Less distortion of shadows;
2. Richer details and better definition;
3. Greater safety for the patient;
4. Easier to center;
5. Simple immobilization.
6. Stability of target-plate distances.

PROFESSIONAL ETHICS IN CUBA

The *Revista de Medicina y Cirugia* of Havana relates that the Medical Press Association of Cuba has decided to undertake a tenacious campaign against quackery, quack advertising and quack practices, and against acts committed by physicians that do not conform to professional ethics. It says: "Notwithstanding the resolutions voted in recent national representative gatherings, the evils in the medical corps are increasing instead of diminishing. It is actually scandalous that, in the very capital of the nation, individuals with university degrees are serving as protectors for animal-magnetism healers, and that in some laboratory and other institutes—perhaps behind the back of their medical directors—efforts are made to get the clients away from physicians who send their patients there exclusively for some laboratory examination." Drs. Aragon, Jr., Montoro and Arteaga brought up the matter at the meeting of the Medical Press Association. Our exchange adds: "It is hoped that something can be done, backed by the authority of the Public Health Service and the ministry for Public Instruction, to fight these elements which show such contempt for professional ethics and their university degree. Now that the first steps have been taken, let the work be continued by the Academia de Medicina, the Colegio Medico and other professional organizations." (Ref. *Journal American Medical Association*, Volume 71, No. 10.)

THE AMERICAN JOURNAL OF ROENTGENOLOGY

PUBLISHED BY PAUL B. HOEBER, NEW YORK CITY

Issued Monthly. Subscription, $5.00 per year. Advertising rates submitted on application. Editorial office, 480 Park Ave., New York. Office of publication, 67-69 East 59th Street, New York

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THE NEW INTERNATIONALISM

The close contact among scientists of the allied nations which has been engendered and stimulated by the war, is resulting, it is gratifying to note, in a *liaison scientifique* which bids fair to develop into a new type of internationalism. To us this is especially noticeable in connection with the field of military roentgenology. Even now, our equipment of men and material for our *x*-ray service abroad is one of the most important of our national activities, and its extent and thoroughness has already made a deep impression on those of our Allies engaged in similar work. Particularly remarkable to them is our ability, by means of the system we have worked out, to install and operate *x*-ray mechanism of large calibre *in forward areas.*

The common efforts of the allied *x*-ray services upon common soil are bound to react as a stimulation for closer scientific relationship, both during the remainder of the war and after it. A more generous exchange of communications and records should, and will, appear in allied literature dealing with matters roentgenologic. Already, in fact, have contributions to our pages reached us from military roentgenologists of other nations. Members of our Society who have been operating with the British forces have contributed in no small measure to the British literature of the subject. The British have been prompt to appreciate the efforts of American coworkers in the field of roentgenology, as in those of surgery and medicine, and especially have the French shown intense interest in the development of American military apparatus for the production and application of *x*-rays. But a short time ago, a society of French military experts was delighted by a description of the late Major Caldwell's stereofluoroscopic apparatus, presented to them, in French, by Lieutenant Colonel Case, Chief Consultant in Roentgenology of the American Expeditionary Forces.

Such events as these point, we believe, to a new and exceedingly interesting type of internationalism which will be welcome indeed.

PERCY BROWN.

TRANSLATIONS & ABSTRACTS

DEAVER, JOHN B. Peptic Ulcer. (*Surg., Gynec. & Obst.*, May, 1918.)

"I have on so many occasions emphasized my conviction that the basic factor in the development of peptic ulcer is infection that it seems almost superfluous to further insist upon it. The toxemic origin of peptic ulcer is generally recognized and there seems little doubt that infection is the primary cause of the toxemia in the vast majority of cases. Furthermore, clinical experience in recent years is indicating more and more clearly that the original site of the infection lies in the vermiform appendix, and Rosenow's demonstration of the elective localization of microorganisms, especially streptococci, is additional confirmation of the infectious origin of these ulcers and similar lesions. Indeed, Rosenow's studies show that the cells of the tissues for which a given strain of bacteria shows an elective affinity may "take bacteria out of the circulation as if by a magnet-absorption." From Bolton's careful histological studies, we learn that the initial lesions which give rise to ulcer of the stomach are localized necrosis of the mucous membrane, localized hemorrhage and inflammation of the lymphatic follicles. The common cause of necrosis is bacterial infection or its toxins circulating in the blood stream and, as pointed out by Bolton, the cells of the gastric mucosa being primarily attacked by the poisons in the circulation, necrosis is readily produced by the local action of the gastric juice. Necrosis may arise in this way without any preceding hemorrhage or lymphatic inflammation, but hemorrhage is an actual and frequent cause of ulcer and is likewise due to bacterial toxins circulating in the blood stream, which, destroying the endothelial cells of the capillaries, pave the way for the local destructive action of the gastric juice. Finally, inflammation of one or more of the lymphatic follicles, so thickly studded along the lesser curvature of the stomach especially toward the pylorus, may give rise to a submucous abscess which by rupture into the gastric cavity allows the juice to act on the base of the ulceration thus exposed.

"Ulcers developing in one or the other of the processes mentioned would heal in a normal stomach, but being constantly exposed to the action of the frequently hyperacid gastric juice they show a tendency to spread rather than to heal and sudden perforation or hemorrhage is often the first indication of gastric ulcer. Or in cases of simple ulcer the tendency is to become callous with chronic peptic ulcer as the result. There is little doubt that every chronic peptic ulcer was at one time acute and began in one of the aforementioned processes."

With the aid of the *x*-ray and various clinical tests and a careful history, correct operative diagnosis of ulcer was made of 88 per cent. of the cases operated on in the last year. Deaver regards every case operated on as a medical failure, and says that the increasing number of medical failures is seen from the increasing number of cases operated on.

NORDENTOFT, J. Pseudoleukemia. (*Hosp.-Tid.* Kobenh., February 20, 1918, p. 225. Ref. *J. Am. M. Ass.*, Vol. LXX, No. 18, p. 1344.)

Nordentoft reports fourteen cases of Hodgkin's disease or other forms of pseudoleukemia. The tumors were rapidly progressive, as a rule, but under roentgen treatment they melted away. After failure of all other measures, this vanishing of the symptoms and return of apparent health within a few days are most amazing. The disease is not conquered, however; constant recurrence is the rule, but there may be long intermissions and the recurrences generally subside equally promptly under renewed roentgen treatment. The greater the susceptibility to the roentgen rays, the graver the outlook; the more frequent, the more rapid and the more malignant the recurrences. There are a few complete cures to the credit of the roentgen rays, but they are extremely rare, and Nordentoft thinks that in many of them there was a mistake in the diagnosis. In his experience, two of his fourteen patients seem to be cured, but the diagnosis of a mediastinal tumor may have been erroneous in one case; the hemorrhagic pleuritis and adhesions may have been of tuberculous origin. In the other case the diagnosis of Mikulicz' disease seems more probable than pseudoleuke-

mia. No other proliferation of lymphoid tissue was to be discovered except in the parotid glands, and the tumors in them had developed very slowly and were apparently benign. In none of the other cases was a cure realized or even to be anticipated. But the long intermissions between recurrences are equivalent to a cure in many cases. Only one of the total fourteen patients seemed to be refractory to the roentgenotherapy. Necropsy in this case showed necrotic processes for which the roentgen rays may have been responsible. In one young man a tumor in the neck, as large as a man's fist, subsided within a day. The exposure had been made at noon and by evening the subjective and objective improvement was pronounced. One girl of 11 with a large tumor masking the shadow of one lung entirely, gave normal roentgen findings with roentgenoscopy two weeks later. But the toxic action from the subsidence of this tumor was so great that the child died, and the conclusion seems inevitable that the roentgen exposure of the tumor was responsible for the fatality. An interesting feature of the roentgen treatment in some of these cases was that unexposed tumors, at a distance from the one being given the roentgen treatment, subsided along with it. This suggests that possibly the blood may acquire a weak radioactivity, sufficient to act on extremely susceptible tissue. But Nordentoft's experimental research on dogs failed to show any such action even when the negative plate was exposed to the blood for days at a time.

KRETSCHMER, HERMAN L. True Prostatic Calculi. (*Surg., Gynec. & Obst.*, Vol. XXVI, No. 1.)

The author emphasized the importance of roentgen diagnosis, both in making the diagnosis and as a postoperative procedure, in the following quotation:

"The diagnosis of prostatic calculi can be definitely established in every case by the aid of the roentgen ray. It is surprising, in view of the fact that the roentgen ray is perhaps the one agent that gives us the most information in the diagnosis of this condition, that its routine employment is so often neglected. Its routine use after the operative removal of stones should always be carried out, so that one may be sure that all of the calculi have been removed. That this is often neglected is very plainly demonstrated by a review of the recent case reports in the literature, a large number of which do not mention the roentgen ray findings. This certainly is unfortunate, as doubtless many of these sufferers seek relief without finding it and are often subjected to many needless examinations and to prolonged courses of treatment without obtaining relief."

He also states that large stones may be found on both sides and on the midline, though usually the calculi are apparently located in one of the lateral lobes, and small calculi may be located in the midline, to one side of it or on both sides.

WHIPPLE, ALLEN O. A Study of Postoperative Pneumonitis. (*Surg., Gynec. & Obst.*, Vol. XXVI, No. 1.)

The author calls special attention to the importance of the roentgenographic method of studying these cases by stating that in a certain percentage shadows in the lungs were demonstrable before physical signs of consolidation were elicited. The site of election is one of the lower lobes.

It is interesting, though not important, to take serial roentgenograms from the incipient rise until the plate shows the lung again clear;

Out of a total of 72 cases roentgenographed, 11 showed a shadow before physical signs appeared.

In 6 cases there were *x*-ray shadows with no signs of consolidation.

In 48 cases the shadow and the signs appeared simultaneously.

In 11 cases there were no shadows but physical signs of consolidation were present.

MEDICOLEGAL. Roentgenographic Pictures in Book as Evidence—Damages for "Blues." (Chicago, R. I. & G. Ry. Co. vs. Smith (Tex.), 197 S. W. R. 614). (Ref. *J. Am. M. Ass.*, Vol. LXX, No. 12, p. 879.)

The Court of Civil Appeals of Texas, in affirming a judgment for $10,000 damages for personal injuries, in favor of plaintiff Smith, holds that there was no error in permitting the plaintiff to introduce in evidence, in connection with the testimony of a physician, certain

roentgenographic pictures of the bones of the normal foot found in the medical work known as "Treatment of Fractures," by Scudder. The court says that on the cross-examination of the physician he stated that the plates or photographs introduced were to his knowledge correct pictures of normal arches of the feet. He further testified that the book containing the plates was a standard work, accepted by the medical profession generally. It further appeared from the record that the condition of the plaintiff's feet, both before and after the injury, was shown by the evidence. In this state of the record, the plates were certainly not immaterial or irrevelant. Their correctness was established by the evidence of the physician, and, while the predicate for their introduction in evidence was not laid prior to their introduction, this objection was removed by proper subsequent proof.

DE ABREU, M. D. Radiology in France during the War. (*Rev. med.-cirurg. do Brazil*, January, 1918, p. 4. Ref. *J. Am. M. Ass.*, Vol. LXX, No. 25.)

De Abreu is chief of the radiologic cabinet connected with the Franco-Brazilian ambulance stationed at Paris, and he descants on the revolution that has taken place in France since the war began in the general estimation of the roentgen rays. Before that, there were a few very eminent radiologists in France but the rank and file of the profession paid little attention to the roentgen rays, "and nothing," he remarks, "opposes such unconquerable resistance to the onward march of ideas as silence." The professional roentgenologists were misled by the Austrians into viewing radiology almost exclusively from the therapeutic standpoint.

The rays were experimented with in every disease and although the results were found excellent in some, this was restricted to certain parasitic skin diseases, tumors and certain forms of bone or skin tuberculosis, and leukemia. The rays were also used in diagnosis by a few French writers, especially the internists. But the majority of the physicians knew little and cared less about this method of examination, and even some of the first class medical services in the hospitals only rarely called for a roentgen examination of a patient, and then only for cancer of the stomach or kidney stones, and the chief of the service never followed the patient to the roentgen room. De Abreu had charge of the roentgen service in the largest hospital, and in his long months there only Chauffard, and he only once, followed the patient to the roentgen room. All apparently were content with the auscultation and percussion, the pathologic anatomy and bacteriology and chemistry findings.

But with the war and the necessity for locating projectiles in the tissues, radiology sprang at once into the first rank, and its importance for diagnosis in wide fields was soon recognized—a revelation for all. At the same time, roentgenology did not detract one iota from the value of clinical examination but enhanced its value. The war precipitated the use of the roentgen rays and de Abreu pleads for a similar diffusion in Brazil of knowledge concerning them and their wide and systematic utilization, without waiting for a war to force it on the country. He urges the creation of a chair for radiology in the University of Rio de Janeiro. Both in civilian and in military circles the young physicians of Brazil should get this training in roentgen work, and perhaps take a leading part in radiology, as some have done already in bacteriology.

MAYO, W. J. Cancer of the Stomach. (*Surg., Gynec. & Obst.*, Vol. XXVI, No. 4.)

"More than 30 per cent. of cancer in civilized man is in the stomach."

He emphasizes the chronic irritation theory and says that perhaps the reason why 85 per cent. of all cancers and ulcers of the stomach involve the lesser curvature is because the *x*-ray shows that food passing into the stomach is not carried directly into the cavity, but by muscular contraction a canal is formed on the lesser curvatures along which it passes.

"The early diagnosis of cancer of the stomach depends upon the roentgen examination and Carman has shown that it may be demonstrated in 95 per cent. of the cases in this way by the time they give sufficient evidence of their presence to call the patient's attention to the fact that something is wrong. Every person in whom there is a suspicion of cancer of the stomach should be promptly subjected to an examination by the roentgen ray. All

persons with anemia which cannot be otherwise explained, should be subjected to such an examination."

ROBERTS, P. W. The Etiology of Perthes' Disease. (*J. Am. M. Ass.*, 1917, lxix, 19, 1598. Ref. *Surg., Gynec. & Obst.*, February, 1918, p. 137.)

The author states that the etiology of osteochondritis of the hip, generally known as Perthes' disease, has been the subject of much speculation ever since the condition was recognized as a clinical entity several years ago. "Traumatism, obscure infection and perverted metabolism have each had their advocates. Tuberculosis has been eliminated because the joints recover with good function, and syphilis has been excluded because Wassermann reactions have been negative."

Notwithstanding the results of laboratory tests Roberts advances the opinion that this affection which occurs with considerable frequency in children is the result of inherited syphilis. In support of this view he states that:

1. A negative Wassermann is not reliable as infallible evidence of the absence of bone syphilis.

2. The pathologic findings described by Perthes coincide with one of the most common expressions of bone syphilis in children, namely, osteochondritis.

3. There are subjects with Perthes' disease who show dental evidence of inherited syphilis.

4. The course of osteochondritis of the hip is similar to that of many other syphilitic joint conditions in that the destructive process is self-limited and that there is a tendency to more or less complete restoration of function.

Roberts believes that the treatment of this condition on the hypothesis that it is of syphilitic origin is worthy of further investigation. In his experience all syphilitic bone and joint conditions improve more rapidly when the dose of potassium iodide is carried to the point of tolerance than when dependence is placed on a routine dose of moderate size.

PHILIP LEWIN.

BUGBEE, H. G. The Management of Renal Tuberculosis. (*Surg., Gynec. & Obst.*, May, 1918, Vol. XXVI, No. 5.)

The author discusses the difficulties of arriving at a diagnosis and says that most unfortunate results follow from hasty diagnosis.

He emphasizes the importance of repeated urethral catheterization and pyelogram in cases showing long remission.

ROBERTS, DUDLEY. The Recognition and Treatment of Intestinal Diverticula. (*Surg., Gynec. & Obst.*, February, 1918, Vol. XXVI, No. 2.)

In the roentgenographic study many of these cases are overlooked, due to their position either directly in front of or behind the lumen of the bowel. Dependence should be placed on daily study of the colon from twenty-four hours p. c. until the meal is entirely discharged from the bowel.

The value of stereoscopic plates is emphasized. The author advises the use of numerous small plates in corpulent patients. Attention is called to the jagged appearance of the sigmoid when seen filled by opaque enema.

SOHMER, A. E. Fracture Sprains. (*Internat. J. Surg.*, 1917, xxx, 292. Ref. *Surg., Gynec. & Obst.*, February, 1918, p. 146.)

So-called sprains are often associated with fracture of bone near a joint, usually a small fragment of bone being torn off by trauma. If overlooked, these leave the joint in a weak, painful or deformed condition, with limited or abnormal joint motion. It is more important to recognize a fracture in injuries which appear to be simple sprains than one which is frankly a fracture away from a joint, because of the bearing on subsequent treatment.

Fracture sprains disable by aiding the process of callus formation, offering subsequent interference with joint motion, the possible loss of proper attachment of ligaments and tendons, interference with fulcrum action of joints, and more or less dislocation with greater permanent deformity, to the factors of ordinary sprain without fracture.

The prompt recognition of fracture sprains is important in railway surgery because of its bearing on liability claims in cases of prolonged disability and permanent deformity.

To verify a diagnosis, the roentgenogram is

the best appliance, either by stereoroentgenogram or plates in different planes. The fluoroscope is not reliable because of the small size of bone fragments and the relative density of tissues near joints.

A knowledge of the development of epiphyses at different ages is important in diagnosis, because of subsequent interference with growth of bones if the true condition is overlooked.

The prognosis of fracture sprains depends on its early recognition and subsequent treatment. They bear an important relationship to constitutional infection elsewhere in the body, especially tuberculosis. Lessened lower resistance by injury may lead to local hematogenous infection. Treatment should provide for sufficient immobilization, careful massage and passive motion.

Fracture sprains which occur most frequently are the following: fracture of the ulnar styloid, accompanying Colles' fracture; avulsion of trochanters of the femur; condyles of the humerus; fracture of the tip of the olecranon or head of radius, the phalanges of foot or hand, the intrinsic cartilages of the knee, the malleoli of the ankle, and the os calcis.

In all injuries near a joint, every apparent sprain should be considered as complicated by a possible fracture, until the latter has been excluded by every means of diagnosis, especially by *x*-ray plates.

MIXSELL, H. R. Osteogenesis Imperfecta. (*Arch. Pediat.*, 1917, xxxiv, 756. Ref. *Surg., Gynec. & Obst.*, February, 1918, p. 147.)

The condition known as osteogenesis imperfecta is described as synonymous with fragilitas ossium and osteopsathyrosis. Attention is called to the influence of heredity in its occurrence. The multiple spontaneous fractures which occur are the result of a distinct deficiency in bone development, the haversian systems of stress-resisting bony rods being absent and the cortex extremely thin. The skull may feel like a rubber bag with mosaic inlays of small pieces of bone around the centers of ossification with the fontanelles wide open.

Metabolism studies of the patients show that the calcium retention is decidedly below normal. The general appearance is that of chronic illness; the skin is soft and delicate, the child is under weight, mentality poor, neck short, chest asymmetrical, extremities short and curved with any sort of deformity due to the fractures. The fractures are usually intraperiosteal and the callus formation is excessive. Structural markings in the spongy bone are absent and the medullary cavity is large showing irregular mottled shadows in the roentgenogram.

Two cases are reported; one, a child of eight months, had fracture of both femurs at birth, and three more painless spontaneous fractures in the first seven months. The skull was tabetic and the back kyphotic. The child improved on cod-liver oil and phosphorus. The other case, a year old, showed many lumps of callus on clavicle, forearms, thighs and legs, an evidence of multiple fractures. The child improved under the same treatment.

W. A. CLARK.

PIRIE, A. H. Shrapnel Balls; Their *X*-Ray Characteristics Compared with Bullets and Other Foreign Bodies. (*Canad. M. Ass. J.*, 1917, vii, 778. Ref. *Surg., Gynec. & Obst.*, February, 1918, p. 163).

Pirie's analysis is based on a study of 10,000 *x*-ray plates made during one year at a hospital in France. Shrapnel balls were shown on 241 plates and bullets on 242. Pieces of shell casing, bombs, hand grenades, etc., were shown on 3,846 plates. In no case did a shrapnel ball pass entirely through the body as a bullet frequently does; they were in several instances stopped by the skin on the opposite side from the entrance. There was no instance of the fracture of the femur shaft or the penetration of the brain by a shrapnel ball. In one instance both tables of the skull were fractured and the ball remained in the bone.

Shrapnel balls are usually of lead, but balls of iron have been found. Differentiation is important if the projectile is to be removed by aid of the vibrator. The shrapnel fragments generally have smooth or rounded edges. If a bone is hit, dust-like particles are seen at the contact.

Pirie believes that the shattering of bone by bullets occurs at the point of exit rather than at the entrance. In soft tissue the wound of exit is larger and more ragged than the wound of entrance.

DAVID R. BOWEN.

DOWNES, W. A. A Case of Giant Duodenum. (*Ann. Surg.*, Phila., 1917, lxvi, 436. Ref. *Surg., Gynec. & Obst.*, February, 1918, p. 129.)

Downes reports a case of giant duodenum in a child of four and one-half years. The child weighed 6 pounds at birth and 29 pounds on admission to the hospital. He had had frequent fits of vomiting since birth, with periods of one to two months' freedom.

At operation the stomach appeared normal with possibly a slight thickening of the wall; the pylorus was normal, and the duodenum was dilated to the size of the stomach. The wall was smooth and three or four times thicker than normal. No diverticula, adhesions, or peritoneal bands were present. Distention involved the entire length of the duodenum, ending abruptly at the point where the gut passed under the superior mesenteric artery. No effort was made to determine the nature or cause of stenosis. The usual posterior gastro-enterostomy was performed.

JAPIOT, P. The Nutrient Canal of the Ilium—its Radiographic Aspect and its Importance in the Diagnosis of Fractures of the Wing of the Ilium. (*Arch. d'électric. méd.*, May, 1918.)

In *The British Journal of Surgery* there have been reported cases of error in the diagnosis of fissured fractures through the wing of the ilium, confusing them with the nutrient canal. These fractures usually are Y-shaped, and often run in the same direction as the nutrient canal, which is formed as a V with the point downwards and the branches rather irregular and different in size. It is only infrequently that the canal can be seen in the *x*-ray, and one must have good plates to be able to see it clearly. The fractures are easy to recognize when they are complete and when there is displacement, but when the fissures are incomplete, one must take great care to always compare with the opposite side. The aspect of the fissured fracture is different from that of the canal; one always gets a uniform shadow without double clear contour.

To make a diagnosis of a suspected fissured fracture of the ilium, it is necessary to have as good plates as possible. Do not try to make a diagnosis from prints, and always roentgenograph the uninjured side for comparison.

SCULLY, FRANCIS J. Perforated Gastric and Duodenal Ulcer: a Statistical Report of Fifty-nine Cases. (*Am. J. M. Sc.*, June, 1918, p. 874.)

In this article Dr. Scully gives us his very valuable experience with perforated gastric and duodenal ulcer from six years' work at the Cook County Hospital. Out of 578 ulcer cases, he has collected 59 cases of perforated ulcers, 48 of them being ulcers of the stomach, and 11 cases of perforated duodenal ulcers. Only the cases where the ulcers were actually seen at the operation are counted in, excluding all doubtful cases.

Of the 48 perforated gastric ulcers, 44 occurred in males, and only 4 in females, showing the most marked predilection for the male cases. The majority of the cases were between 30 and 40 years of age. The duodenal ulcer occurred entirely in men, and at a slightly earlier age.

Some of the cases were found to have had previous gastric disturbances, but very often the history obtained was uncertain. The only and most constant prodromal symptom was pain, often associated with eating; but many cases did not give any prodromes at all, and practically in every case the onset was very sudden, with an agonizing pain in the epigastrium. Vomiting occurred in 35 of the perforated gastric ulcers, shortly after perforation, and in 6 cases of the duodenal ulcer.

Following the sudden onset of pain there was a period of reaction. At this time the seriousness of the condition was difficult to recognize, and a dangerous delay was thus often caused. Later on the recurrence of pain indicated the onset of peritonitis.

In the examination, the point of natural tenderness corresponded to the point of maximal pain. In cases seen later, the tenderness was more generalized. Rigidity was always present. Fluid was diagnosed in some of the cases. In the early stages the pulse was not much increased in rate, although the leukocyte count was increased; while in later stages the pulse was rapid. When seen early and when a good history was obtainable, the diagnosis was not difficult. Acute appendicitis, acute cholecystitis, acute pancreatitis, ruptured appendix and general peritonitis are the conditions from which to differentiate the perforated ulcer, but in many of the cases the

diagnosis was first made on the operating table.

The most common site of perforation in gastric ulcers was on the anterior wall of the stomach near the pylorus along the lesser curvature. Only in 4 cases was the perforation posterior. In all the cases of duodenal ulcer the perforation was anterior, near the pylorus.

The prognosis was never very good, only 16 cases recovering out of 40 cases of perforated gastric ulcers and 5 cases of perforated duodenal ulcers. Several of the cases died of shock.

The mortality was found to be proportionate to the length of time elapsing after the perforation, and it is evident after a study of Dr. Scully's cases that an early recognition of the condition followed by an immediate operation is necessary for the best results. Considerable confusion in the diagnosis of the perforation arises from the fact that the patient presents a markedly different clinical picture in the various stages. The symptoms are not progressive, and the physical signs not well developed until comparatively late.

NOGIER, TH. Procédés de protection. (*Arch. d'electric. méd.*, No. 426, March, 1918.)

In this article about protective measures for roentgenologists, especially in war work, Dr. Nogier first points out the very important reasons for adequate protection, as well in fluoroscopic as in roentgenographic work; he compares the protective measures against the *x*-rays to the gas masks against the asphyxiating gases. The protection can be made in two places, either stopping the rays on their point of emission or where they first meet the body of the roentgenologist. In the first category is the lead glass shield. The writer does not consider that sufficient, as the glass must be enormously heavy for the rays not to penetrate it, and there are always so many openings through which the secondary rays especially can escape. In the estimation of the author the measures which render protection against the rays when they meet the body of the roentgenologist are much superior.

For protection of the hands the five-fingered glove of soft pliable lead rubber is the only good measure; the old stiff glove, used in the first part of the war, was perfectly useless for quick work and was always residing in a corner, while the work was done with unprotected hands.

For protection of the head, eyes and the face one must be certain of the perfect opacity of the lead glass in front of the fluoroscopic screen and of the sufficiently large size and opacity of the lead glass spectacles. Better than these Dr. Nogier found the metal helmet with the movable visor of lead glass. This consists of a helmet, similar to the trench helmets, with a front piece of lead glass reaching down to the chin, protecting the whole face, the eyes, and the hair, and with two side pieces of metal for the protection of the ears. The front part of lead glass may be closed and opened between the examinations by means of a hinge. This apparatus has been very much employed by Dr. Nogier and his assistants.

For the protection of the chest and abdomen the lead rubber aprons seem sufficient, but one must always be certain to get them large enough to reach all the way around the back.

For the protection of the legs, leggings made of lead rubber have been employed, but it is much better and easier to construct side walls on the four sides of the operating table from the table top to the floor.

Besides all these protective measures the roentgenologist must always employ the most rigorous discipline in this work to avoid all direct radiation of even the shortest duration; one must constantly think of avoiding the rays just as a surgeon must avoid microbes.

A few cardinal regulations for this discipline follow:

1. The roentgenologist must never make any examination without an apron, gloves, and spectacles; or better still, he should wear the protective helmet.
2. The roentgenologist ought always to work with the smallest possible opening of the diaphragm.
3. The roentgenologist ought never to palpate by hand for a foreign body under the screen, even when employing an opaque glove.
4. The palpation must always be done with a metallic instrument placed on the end of a wooden handle.
5. In every examination the current must not be turned on except at the exact moment of use. For this purpose the foot switch of Hirtz ought to be employed.

6. The roentgenologist ought never to hold in his hand the fluoroscopic screen, but he should always hold it by a handle fixed anteriorly to the frame of the screen.
7. When it is necessary to take off the gloves for more delicate localization, the roentgenologist must never hold the pencil for marking on the glass or the patient directly in his hand, but must employ a pencil holder with a protective cuff.
8. In the case of the employment of the Coolidge tube, one must always remember that in this tube the rays are emitted posteriorly to the anticathode, and that it therefore exposes the roentgenologist much more than the other tube.
9. If there are numerous fluoroscopic examinations in the vertical position, the roentgenologist ought to employ a small Spanish wall, lined with lead, to protect the knees and the legs.

Résumé.—When combining all these procedures and using them in a systematic way, one may not avoid all the dangers, but one may reduce them to an infinitesimal proportion.

PEER LUND.

WHITE, FRANKLIN W. Improvements in the Diagnosis of Chronic Ulcer of the Stomach and Duodenum. (Medical Clinics of North America, Boston Number, January, 1918.)

Dr. White lays emphasis on the value of following the progress of ulcers by means of the *x*-ray. While recognizing the great value of the roentgen studies, he regrets the increasing tendency to accept the roentgenologist's diagnosis without studying the case from the clinical and laboratory side. He reports five operated cases to illustrate the general points cited below.

The "six-hour residue" is a minor sign in ulcer, but valuable as a test of function and guide to treatment.

In deciding whether delay in emptying is due to spasm of the pylorus or actual tissue narrowing, he emphasizes the use of atropin. If the stomach relaxes and empties after the use of atropin, it can be concluded that the obstruction was due to spasm. If, however, the obstruction does not relax after atropin, spasm as a cause of delay cannot be absolutely ruled out. Muscular spasm is a very variable and intermittent affair and such a patient does not always behave alike at different times, entirely apart from the use of drugs.

As regards the effect of ulcer deformity on the emptying of the stomach, he finds that the oldest ulcers, as a rule, produce the most deformity but do not necessarily show the most obstruction. Deformity means old scar tissue or adhesions, as well as active ulcer which may cause deformity from spasm.

The greatest stress is laid on the demonstration of the ulcer itself by finding a defect in the stomach or duodenal wall. The indirect signs, such as changes in peristalsis, spasm and six-hour residue are valuable as indications of something wrong. They occur in ulcer and also in other conditions, such as chronic appendix or gall-bladder or general nervous irritability.

Under medical treatment, the deformity of gastric ulcer disappeared in a number of cases. In cases showing marked deformity of the duodenum, he found that while the deformity might be greatly lessened, it did not entirely disappear.

The late diagnosis of the condition of ulcer after treatment is considered as of great importance. Some of the functional tests are repeated after two or three weeks of treatment. In all cases it is recommended that the patient be examined at least once in three months during the first year, whether symptoms are present or not.

HERMAN A. OSGOOD.

MILLET, JOHN A. P., AND MUELLER, THEODORE. Some Phases of Radium Action with Special Reference to the Hematopoietic System. (*J. Cancer Research*, April, 1918).

In the large amount of work done in the study of the effects upon the hematopoietic system of exposure to radioactive substances most conclusions have been based upon lower animal experimentation. The chief results have been those of roentgen ray effects, such as the destruction of lymphoid cells, explosive in character and preceding effects upon other body cells; destruction of bone marrow cells *in situ;* primary rise in the polymorphonuclear count, followed by a subnormal drop; a steady decline in the lymphocyte count; and resistance of red cells to radiation. Aside from a

vague knowledge of blood changes in roentgenologists, there is very little definite knowledge of the effects of radiation upon man. Schweitzer, who studied the effects upon the blood following heavy mesothorium exposures in cases of carcinoma of the cervix uteri and vagina, observed a primary leucocytosis, followed by a drop below the original count within twenty-four hours and maintained for eight weeks; a primary drop in lymphocytes followed by lymphocytosis; a similar change in the eosinophile count; and absence of any effects upon red cells. He attributed these changes to the production of toxic substances of unknown origin, and regarded the leucopenia as an unfavorable effect.

For their investigations, the authors selected ten cases of squamous cell carcinoma of the cervix uteri and vagina for the purpose of studying the immediate and remote effects of the therapeutic radium exposures upon the activity of the blood-forming organs. Some of the patients received roentgen ray exposures in addition. The technique consists of a comparatively small amount of 50 mg. radium element placed in a brass applicator, surrounded by a finger cot, and applied for thirty hours in each instance in which immediate effects were studied, with two exceptions. The applicators were packed in place by cotton, or the healthy portions of vaginal walls were protected by placing the applicator in half cylinders of 2 mm. lead, using adhesive plaster and rubber to cut off secondary radiation from the latter. Blood studies were made immediately before the application and at intervals of one-half, one, two, four, six, nine and twelve hours after the application started, and then daily. The patients received no breakfast, had a light luncheon after the six-hour count, and supper after the twelve-hour count. The subsequent daily counts were made three or four hours after breakfast. Observations were made by the same individual throughout any given series.

It is difficult to render a concise summary of the results, but the more important conclusions drawn may be briefly summarized as follows: The remote effects of radium alone were similar to those of combined radium and roentgen ray applications. The *immediate* effects of radium were an immediate drop in the total leucocyte count, reaching its minimum in from one-half to six hours, with a return to the original level within twenty-four hours and usually within twelve hours, and an occasional rise to a higher point than the original in from twelve to seventy-two hours after the application. The total polymorphonuclear count closely paralleled this. The total lymphocyte and large mononuclear counts showed no characteristic changes. The relative lymphocyte count showed a tendency to drop and the polymorphonuclears to rise during the application, but this tendency was reversed during the period immediately following. The *remote* effects were a fall in the lymphocyte count from two to four weeks after treatment, lasting until the end of the second month; a fall in polymorphonuclears, sometimes simultaneously with the lymphocytes, but usually coming on later and being less striking; an attempt of the lymphocytes to recuperate and rise to the original level at some later date. The *late* effects were a relative increase in polymorphonuclears and decrease in lymphocytes without leucocytosis, as the patient's resistance weakened; and a terminal leucocytosis, due mainly to an increase in the absolute polymorphonuclear count, although usually accompanied by an absolute decrease in lymphocytes.

Theoretical conclusions: In the terminal stages of death from cancer there is a relative and often absolute lymphopenia, although this may not appear until a few days before death, and there may be an increase up to such a time. The lymphocyte count is, therefore, not an infallible index to the patient's resistance at any given time. As all the patients were hopeless ones the above changes cannot be used as a guide to the proper intervals and dosage of the applications, but it does not seem unreasonable to suggest that no second application should be made until the lymphocyte count has recovered from the preliminary drop following the first application. Information is desirable as to the behavior of the blood in patients treated under more favorable circumstances. The exact mode of action of radium upon the blood is uncertain. There is ample clinical and histological evidence that radium has a definite local action on malignant growths, detrimental to their development, but there is a more general effect we do not understand. Further blood studies may explain some of the miraculous cures on the one hand and the unexpected failures on the other.

It seems not impossible that the early blood changes noted were due to the sudden introduction of protein substances from cell destruction into the blood, with the same effects upon the blood-forming organs as are caused by intravenous injections of foreign protein. Even if this be true, however, it does not justify the assumption that the therapeutic effect of radium is dependent upon the formation of these products of abnormal cell destruction.

H. K. Pancoast

Holmes, George W. The Examination of the Heart and Great Vessels by Means of the *X*-Ray. (Medical Clinics of North America, Boston Number, January, 1918.)

The writer presents a method for the roentgenographic examination of the heart which combines the advantages of fluoroscopy, orthodiagraphy and teleroentgenography; and provides a fairly accurate knowledge of the size, shape and pulsations of the various chambers.

The fluoroscopic observations are made with the tube at a distance of 2½ feet and the patient upright in the anteroposterior and right oblique positions. The rapidity, force and time of pulsations in the various chambers are noted. Tracings are made on glass of the outline of the heart and great vessels; the excursion of the diaphragm and the changes in outline and position of the heart with respiration are recorded. This tracing is then transferred to a chart which is used in conjunction with a plate taken at a six-foot target-film distance during normal breathing. Measurements are made on the plate of the length and breadth of the heart, distance of the right and left borders from the midline, and the distance across the great vessels.

The various lesions of the heart and great vessels are briefly discussed and their roentgenographic appearance described. A table of normal heart measurements is offered by Claytor and Merrill. Herman A. Osgood

George, Arial W., Leonard, R. D., and O'Brien, F. W. The Roentgen Diagnosis of Diseases of the Upper Right Abdominal Quadrant. (Medical Clinics of North America, Boston Number, January, 1918.)

The authors find that a normal first portion of the duodenum in serial plate rules out surgical ulcer. A second portion of the duodenum which, instead of passing directly downward, passes outwards towards the liver border and then curves to its normal position, they consider almost pathognomonic of gall-bladder disease. From the study of a series of cases they find that the gall-bladder shadow seen in the *x*-ray plate is always indicative of a pathologic change. This shadow may vary in size, is usually characteristically pear-shaped, and may be found almost anywhere on the right side below the diaphragm. Gall-stones, they claim, can be demonstrated by proper *x*-ray technique whenever present. They take a series of plates of the right upper quadrant on the fasting patient. They then pay particular attention to the examination of the barium-filled duodenum in relation to the densities seen in the right upper quadrant. They also find that considerably more gas will be found in plates of the right upper quadrant in gall-bladder disease than in the normal. A gas-filled hepatic flexure and transverse colon in the six and twenty-four hour plates following the bismuth meal is considered quite characteristic in gall-bladder disease.

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